BODY FLUID ABSORBENT MATERIAL CONTAINING PERIODIC ACID AS DEODORIZING AGENT

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An absorbent material for use in absorbing body fluids, has a fluid permeable outer portion impregnated with deodorizing amounts of periodic acid.

8 Claims, No Drawings
This invention relates to an absorbent material for absorbing body fluids and in a particular embodiment thereof to a catamenial device or sanitary napkin for absorbing fluid associated with menstrual discharge. 

Therefore, it has been known to utilize in an absorbent material for absorbing body fluids, and especially in sanitary napkins, as a deodorizing agent, a bactericide or a fungicide, inasmuch as these agents are known to act directly on the micro-organisms of the vaginal flora by killing such micro-organisms. It is also known that the formation of odors associated with menstrual discharge are occasioned by the biological degradation of the menstrual discharge by these micro-organisms to form ammonia, dimethylamine and particularly trimethylamine as well as other basic substances. Thus while the use of bactericides and fungicides has been found effective to eliminate the source of such odors, by destroying the micro-organisms, however it has also been found that the use of these bactericides and fungicides is also disadvantageous in that they tend also to destroy the vaginal flora. This harmful effect thus significantly minimizes a widespread acceptance of sanitary napkins containing bactericides and fungicides and gynecologists generally recommend they not be used. 

It has also been proposed to utilize certain oxidizing agents, such as peroxides, as a deodorizing agent in sanitary napkins. These known oxidizing agents however have been found to be generally inefficient in their deodorizing activity. They have also been found to provoke irritation of the vagina and even to destroy at least part of the vaginal flora. 

The applicants have now surprisingly found that it is possible to eliminate the formation of odors associated with menstrual discharge without disadvantageously affecting the vaginal flora by providing a sanitary napkin comprising a body of an absorbent material having a fluid permeable outer portion for contact with the vaginal mucous, said outer portion containing periodic acid in amounts effective to deodorize said fluid associated with menstrual discharge. 

In accordance with this embodiment of the invention, when the sanitary napkin is applied directly on the pelvic region, particularly on the vulva and perineum, essentially no irritation is experienced by the user and the periodic acid present in the napkin does not destroy the micro-organisms of the vaginal flora, thereby maintaining a physiological balance. It has also been observed that the elimination of undesirable odors is rapid and that the deodorizing effect persists for even several hours after removal of the sanitary napkin. 

Thus, the sanitary napkins of the present invention exhibit several significant advantages over presently known catamenial devices such as non-irritation of the vulva and perineum regions, preservation of the vaginal flora, rapid and essentially total elimination of undesirable odors associated with menstrual discharge and a prolonged deodorizing activity, even after removal of the sanitary napkin. 

Tests have been conducted to show, unequivocally, that the micro-organisms present in the vagina are not destroyed in the presence of the periodic acid present in the sanitary napkin of this invention. Such micro-organisms include the following: Bacillus Subtilis, Sar-cina Lutea, Escherichia Coli, Proteus Vulgaris, Staphylococcus Epidermitis, Streptococcus Fecalis, Herellea Vaginica, Saccharomyces Cerevisiae, Lactobacillus Acidophilus, Lactobacillus Bifudus and Micrococcus Aureus. It can thus be concluded that the periodic acid, in not destroying these micro-organisms, directly acts rather on the products of biological degradation of the menstrual discharge, as described above, and thus avoids destroying the vaginal flora. 

For instance, it has been observed that when there is applied to an absorbent material saturated with periodic acid a culture of micro-organisms as described above, the culture of micro-organisms does not develop in those areas which have been subjected to the action of periodic acid. However, when the absorbent material containing the periodic acid is removed, it is observed, after a period of about 24–48 hours, that the culture develops under normal conditions and that the micro-organisms which have been subjected to the action of the periodic acid can be used to grow other cultures which develop in the same manner as if they had been grown from micro-organisms not subjected to the action of periodic acid. 

Thus, it has been observed that activity characteristics of periodic acid provide acceptable levels of the elimination of undesirable odors over a prolonged period, even when the sanitary napkin containing the same has been removed. For example, it has been noted that the elimination of these odors continued to be effective five hours after removing the sanitary napkin of this invention, even when this sanitary napkin was replaced by a conventional cantamenial device not containing the active deodorizing agent of this invention. 

Furthermore, the safety of periodic acid has been verified by the following tests involving a vaginal injection of the same on three animal species: a rabbit, a guinea pig and a rat. An aqueous solution of the following concentration (2-5 ml of a N/2 solution for the rabbit; 3-5 ml of a N/2 solution for the guinea pig; and 5-8 ml of a N/2 solution for the rat) is administered by a syringe in the vagina of these animals each day for a period of 15 days. The animals were then killed and the autopsy performed on each revealed that the vagina was in perfect shape. Furthermore, biopsies of the vagina were carried out and in all cases normal histological images were obtained. 

The absorbent material used to produce the device of the present invention can be woven or non-woven cel-lulosic material (such as cotton), wool or synthetic textile fibers, such as those of viscose, rayon and the like. Obviously other conventionally employed absorbent materials used to produce sanitary napkins, dressings or bandages can also be employed. In one embodiment of this invention, a sanitary napkin can be made up of several superimposed layers of a selected absorbent material, shaped to the desired configuration, such as an elongated body, to form the core which then can be essentially surrounded by a fluid permeable outer portion, for instance a layer of gauze or netting conforming to the selected configuration. Obviously other shapes and assemblies of absorbent materials can be employed depending upon the desired end use, such as for a medical bandage or dressing. The entire absorbent material need not be impregnated or saturated with periodic acid, it having been found that only the fluid permeable
outer portion of the absorbent material which is in direct contact with the body need contain the deodorizing agent of the present invention. Thus, in a sanitary napkin, it is only necessary that the outer layer or portion of the napkin which comes into contact with the pelvic region contain the periodic acid.

The quantity of periodic acid present in the fluid permeable outer portion of the absorbent material can be quite small thereby avoiding any possible harmful effect when the absorbent material is in direct contact with the body. Generally, the periodic acid is present in amounts of about 0.015 to 0.5 mg/cm² grams per square inch, preferably about 0.02 to 0.35 mg/cm² grams per square inch in the fluid permeable outer portion of the absorbent material which comes into direct contact with the body. For conventional sanitary napkins having a surface area of about 100 to 200 cm² this amounts generally to about 1.5 to 100 mg while for conventional tampons having a surface area of about 20-30 cm² this amounts to about 0.3 to 15 mg (total) of periodic acid in the outer portion of the napkin.

The present invention also relates to a method for preparing an absorbent material for absorbing body fluids, said material comprising an absorbent core essentially surrounded by a fluid permeable outer portion, said method comprising impregnating a portion of an absorbent material with a solution of periodic acid in a solvent selected from the group consisting of water and an aqueous alcoholic solution, evaporating said solvent from said portion and assembling said portion about said core to form said absorbent material. Generally, the solvent is evaporated by subjecting the portion of absorbent material which constitutes the fluid permeable outer portion of the absorbent material to a temperature in the range of about 30°-50°C. The absorbent material of the present invention can also include conventionally employed adjuvants such as perfume, antiseptics, antibiotics, blood coagulants, disinfectants, local anesthetics, coloring agents and the like, the choice of any particular adjuvant depending upon the ultimate use of the absorbent material as a dressing, medical bandage, diaper, sanitary napkin or the like.

The following examples describe the production of a sanitary napkin according to the teachings of the present invention and are to be considered as exemplary only.

Example 1
Material to be used as the fluid permeable outer portion of a sanitary napkin and known under the trademark CRYLOR (polyamide synthetic fiber) was impregnated with a N/10 aqueous solution of periodic acid. The material was then placed in an oven at a temperature of about 37°C for a time sufficient to evaporate essentially all the water therefrom. The dried material was then assembled about a core of absorbent material to constitute the said fluid permeable outer portion of the resulting sanitary napkin which had a total weight of 15 g and which contained 8 mg of periodic acid.

This sanitary napkin used in a conventional manner eliminates the formation of undesirable odors and does not destroy the vaginal flora. Further, the deodorizing activity of the periodic acid persisted for a period of about 5 hours after removal of the napkin.

The quantity of periodic acid (8 mg) impregnated on the sanitary napkin was determined using another outer portion impregnated with essentially the same solution and dried under essentially the same conditions. This sample was then impregnated with water and the resulting aqueous solution was potentiometrically dosed using a N/50 solution of trimethylamine.

Example 2
Non-woven cotton material to be used as the fluid permeable outer portion of a sanitary napkin is impregnated with a N/5 aqueous solution of periodic acid. The material is then dried in an oven at a temperature of about 45°C to evaporate the water, after which it is assembled about a core of absorbent non-woven cotton to constitute the said fluid permeable outer portion of the resulting sanitary napkin which had a total weight of 13 g and a periodic content of 4 mg. The periodic content was determined essentially in the same way as set forth in Example 1, using a sample napkin prepared in essentially the same way.

Example 2 is repeated except that in one instance the absorbent material employed was rayon and the quantity of periodic acid of the resulting napkin was 3.5 mg and in another instance the absorbent material was viscose and the quantity of periodic acid of the resulting napkin was 7 mg.

Each of these sanitary napkins, conventionally employed, rapidly eliminated undesirable odors and exhibited prolonged activity without destroying the micro-organisms of the vaginal flora. Further, after removing each of the napkins, the deodorant activity persisted for about 5-8 hours.

Example 3
Cotton fabric to be used as the fluid permeable outer portion of a cylindrically shaped sanitary napkin is saturated with a N/10 aqueous solution of periodic acid. The thus impregnated cotton fabric is dried at a temperature of about 30°-40°C after which it is assembled about a core of absorbent cotton fabric to constitute essentially the outer portion of the resulting sanitary napkin. The resulting assembly is then enclosed in an outer cotton netting or gauze to provide a sanitary napkin weighing about 5 grams and containing about 5 mg of periodic acid, this quantity being determined in essentially the same manner as described in Example 1.

The resulting sanitary napkin, used in a conventional manner, essentially eliminated the formation of undesirable odors and did not destroy the bacterial flora of the vagina. Further, the deodorizing activity of the periodic acid persisted for a period of about 5-6 hours after removal of the sanitary napkin from the vagina.

What is claimed is:
1. An absorbent material for absorbing body fluids having in a fluid permeable outer portion thereof which is in direct contact with the body periodic acid in amounts effective to deodorize said body fluids.
2. The absorbent material of claim 1 comprising a shaped article made of woven or non-woven cellulose, wool or synthetic textile fibers.
3. The absorbent material of claim 2 wherein said absorbent material comprises an absorbent core essentially surrounded by said fluid permeable outer portion which is in direct contact with the body, said outer portion being saturated with 3-10 mg of said periodic acid.
4. The absorbent material of claim 3 wherein said outer portion is saturated with 4–7 mg of said periodic acid.

5. A sanitary napkin for absorbing fluid associated with menstrual discharge comprising a body of an absorbent material having a fluid permeable outer portion for contact with vaginal mucous, said outer portion containing periodic acid in amounts effective to deodorize said fluid associated with menstrual discharge.

6. The sanitary napkin of claim 5 wherein said absorbent material comprises an absorbent core essentially surrounded by said fluid permeable outer portion which is in direct contact with the vaginal mucous, said outer portion being saturated with 3–10 mg of said periodic acid.

7. The sanitary napkin of claim 6 wherein said outer portion is saturated with 4–7 mg of said periodic acid.

8. The sanitary napkin of claim 5 wherein said absorbent material is woven or non-woven cellulose, wool or synthetic textile fibers or mixtures thereof.

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