**Injectable composition comprising sodium deoxycholate**

*Injizierbare Zusammensetzung enthaltend Natrium Deoxycholate*

*Composition injectable contenant de déoxycholate sodium*

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**References cited:**
- EP-A2- O 208 519
- WO-A2-2005/063205
- US-B1- 6 489 312


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RELATED APPLICATIONS

The present application claims priority to U.S. Provisional Application Serial Number 60/572,879 filed May 19, 2004.

FIELD OF THE INVENTION

The present invention is related to cosmetic methods for the non-surgical removal of localized fat accumulation. Specifically, the method involves pharmacologically active sodium deoxycholate compositions that are suitable for injection directly into a treatment site of a patient in need of fat removal without the need for surgical intervention.

BACKGROUND OF THE INVENTION

Numbers appearing in parentheses at the end of a sentence refer to specific references cited at the conclusion of this specification immediately before the claims.

Formulations containing phosphatidylcholine and bile salts (phosphatidylcholine bile salt formulations, PBF) are increasingly being utilized to treat localized fat accumulation (1-8). Several open label clinical studies have reported promising results using injections of PBFs for the treatment of localized fat accumulation, including lower eyelid fat herniation and "buffalo hump" lipodystrophy (1-3).

Phosphatidylcholine is a natural phospholipid that is an essential component of cell membranes and is important for normal cellular membrane composition and repair. Phosphatidylcholine is also the major delivery form of the essential nutrient choline. Choline itself is a precursor in the synthesis of the neurotransmitter acetylcholine, the methyl donor betaine and phospholipids, including phosphatidylcholine and sphingomyelin among others. Phosphatidylcholine is also involved in the hepatic export of very-low-density lipoproteins. WO 2005/063205 describes injectable compositions comprising phosphatidylcholine.

Bile salts have been used to improve the aqueous solubility of phosphatidylcholine and more recently, medications like amphoterin B, Taxol®, and diazepam (9-14). Highly purified phosphatidylcholine can be combined with the secondary bile salt sodium deoxycholate, an anti-microbial, benzyl alcohol, and water to form a stable, mixed micelle preparation that can be rapidly sterilized and used for intravenous administration (12). Pharmaceutical preparations of this mixture, known as Essentiale® and Lipostabil®, are marketed in other countries for treatment of liver disease and hyperlipidemia, respectively (12,15).

Rittes first reported that injections of a PBF into subcutaneous fat reduced infraorbital fat herniation (1). Since then, physicians have been using the pharmaceutical preparations or similar, compounded PBFs, to treat lower eyelid fat herniation, as well as fat deposits on the thighs, abdomen, upper back, chin, and arms (2,3,5). These PBFs often lack the dl-alpha-tocopherol (vitamin E), B-vitamins, and adenosine monophosphate variably found in Essentiale® and Lipostabil® (2,16).

Phosphatidylcholine formulations are associated with localized burning sensations, erythema, transient urticaria and variable degrees of pruritus all of which usually resolve within a few days. More serious sequelae of ulceration and pain have also been seen. An infectious granulomatous reaction has been reported in the thigh of a patient at the site of multiple phosphatidylcholine injections (7). Increased dosages of injected phosphatidylcholine have paralleled side effects seen with large doses of oral and intravenous formulations of Lipostabil® and include nausea, diarrhea, abdominal pain and syncope.

The mechanism whereby phosphatidylcholine-containing formulation cause reduction of subcutaneous fat deposits is unknown but several mechanisms have been proposed (4). The first is that phosphatidylcholine could reduce the size of lipocytes by stimulating lipase activity. Alternatively, the PBFs have been postulated to function as a detergent that emulsifies lipocyte cell membranes. Detergents have been used in medicine for decades, specifically, as sclerosing agents commonly used in sclerotherapy (American College of Phlebology, 2003). Detergents possess unique polar and non-polar chemical properties which facilitates emulsification of insoluble substances by reducing surface tension at their interface (17). In fact, laboratory detergents like Triton® X-100 and Empigen® BB are commonly used to disrupt the lipid bilayer of cell membranes (10,18-21). Two major components of the PBFs, phosphatidylcholine and sodium deoxycholate, have these unique chemical properties and therefore have been used independently as detergents or emulsifying agents (9,18,20-25).

Surgical and non-surgical procedures for improving appearance have increased in prevalence as populations age and gain weight. Liposuction is one of the most popular cosmetic surgery procedures and involves the surgical removal of fat deposits using suction and optionally assisted by solutions to assist in fat removal. Liposuction, also known as lipoplasty or suction lipectomy, is a surgical procedure that removes fat through an incision in the skin through which
a cannula is inserted. The cannula is connected to a suction source and the unwanted fat is aspirated through the cannula and discarded. Liposuction is performed under general or local anesthesia, depending on the amount and location of the fat to be removed.

[0011] The most commonly used forms of liposuction additionally use fluid injection methodologies wherein a medicated solution containing a mixture of salts, an anesthetic and a vasoconstrictor, is infused into the treatment site prior to aspiration of the fat tissue. The medicated solution helps the fat be removed more easily, reduces blood loss and provides anesthesia both during and after surgery.

[0012] In an example of adjuvant solutions for liposuction, a United States Patent filed on April 22, 1997 and issued as U.S. Patent Number 5,891,083 on April 6, 1999 by Capella and Capella teaches liposuction and a carrier solution containing a compound for an improved surgical procedure for removing subcutaneous fat. In one embodiment the Capella patent discloses the compound is an enzyme, particularly lipase or colipase. The enzyme is added to a carrier such as saline solution to provide a lipolysis solution. In another embodiment of the invention, Capella teaches emulsifying agents such as bile salts may also be beneficial in combination or as the primary active compound added to the solution. In every embodiment of the Capella invention, the lipolysis solution is administered for a period of time before liposuction to allow for the solution to infiltrate the fat tissue. Nowhere in Capella is the use of a lipolysis solution alone disclosed as a non-surgical means for removing fat from the body. In all examples and specific embodiments disclosed in Capella, liposuction is used as a surgical procedure for fat removal and lipase and bile salts are provided as an adjuvant to liposuction.

[0013] However, liposuction and other surgical methods of fat removal are associated with significant adverse events including temporary bruising, swelling, numbness, soreness and burning sensation, risk of infection, pigmentation changes; the formation of fat clots or blood clots which can migrate to the lungs and cause death, excessive fluid loss, which can lead to shock or fluid accumulation that must be drained, friction burns or other damage to the skin or nerves or perforation injury to the vital organs. Additionally, liposuction requires a recovery time of one to two weeks wherein the patient cannot work or perform certain daily activities. Moreover, because surgical procedures such as liposuction require local and occasionally general anesthesia, significant anesthesia-related risks are associated with surgical fat removal.

[0014] Therefore it would be desirable to have a method of removing localized fat accumulations that does not require surgery or prolonged recovery time and has fewer adverse side effects than currently available methods.

SUMMARY OF THE INVENTION

[0015] The present invention provides a cosmetic method of non-surgical removal of localized fat accumulation, comprising administering by injection a composition consisting essentially of sodium deoxycholate and one or more pharmaceutically acceptable excipients, wherein said composition is free of phosphatidylcholine. Prior to the discovery of the present invention, prior art formulations (hereinafter referred to as phosphatidylcholine bile salt formulations (PBFs)), containing phosphatidylcholine (PC) and bile salts used to reduce localized fat deposits were thought to function through the activity of phosphatidylcholine alone. Detergents such as bile salts were, merely added in small quantities to disperse the PC. However, the present invention unexpectedly demonstrates that bile salts alone, such as sodium deoxycholate, are the active agents responsible for the reduction of localized fat deposits, and possess detergent effects on muscle and connective tissue.

[0016] For the purposes of the present invention, a cosmetic non-surgical method of fat removal does not include liposuction, lipoplasty or suction lipectomy.

[0017] In yet another embodiment of the present invention the composition further comprises one or more additional ingredients selected from dispersion agents, penetration enhancers, and preserving agents. In a further embodiment, the dispersion agent is selected from hyaluronidase and collagenase.

[0018] In an embodiment of the present invention, the patient is a human.

[0019] In another embodiment of the present invention, the non-surgical method does not include liposuction.

[0020] In embodiments of the present invention, the composition is administered by subcutaneous injection directly into fat tissue.

[0021] In an embodiment of the present invention, the localized fat accumulation is lower eyelid fat herniation, fat accumulation on the waist or hip, xanthelasma, lipomas, lipodystrophy including "buffalo hump" lipodystrophy or fat deposits associated with cellulite.

[0022] In another embodiment of the present invention, the localized fat accumulation is lower eyelid fat herniation.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] FIG. 1 depicts the molecular structure of (a) phosphatidylcholine (b) sodium deoxycholate and (c) benzyl alcohol.
FIG. 2 depicts the effects of phosphatidylcholine bile formulation (PC Formula, PBF) and sodium deoxycholate alone on cultured cell viability according to the teachings of the present invention: (a) MTS assay measuring viability of keratinocytes exposed to the PC Formula and sodium deoxycholate alone; (b) Lactate dehydrogenase (LDH) assay measuring LDH release by cells exposed to the PC Formula and sodium deoxycholate alone.

FIG. 3 depicts the effects of PBF and sodium deoxycholate alone on primary porcine fat tissue according to the teachings of the present invention: (a) MTS assay producing purple pigment, indicating living cells, in fat specimens treated with the PBS buffer as negative control (- Cont), sodium deoxycholate alone (DC), the PBF (PC), and Triton® detergent as positive control (+ Cont); (b) A comparison of fat cell viability between the different treatments.

FIG. 4 depicts calcein fluorescence in fat specimens treated with sodium deoxycholate alone (DC), PBF (PC), Triton® detergent as positive control (+ Cont), and PBS buffer as negative control (- Cont) according to the teachings of the present invention.

FIG. 5 depicts light microscopy of porcine skin biopsies after treatment with compositions made according to the teachings of the present invention revealing (a) control lipocytes and (b) lipocytes after PBF injection (H&E, original magnification, x20); (c) control lipocytes and (d) lipocytes after injection of sodium deoxycholate alone (H&E, original magnification, x10); (e) control muscle and (f) muscle after injection of phosphatidylcholine alone (H&E, original magnification, x10); (g) fat after injection with Empigen® detergent (H&E, original magnification, x20).

FIG. 6 depicts a lipoma removed from a patient two days after injection with deoxycholate according to the teachings of the present invention: (a) gross pathology and (b) histology (H&E, original magnification, x20).

DETAILED DESCRIPTION OF THE INVENTION

[0024] The present invention addresses the problem of localized fat accumulation in patients by providing a non-surgical method for removing fat deposits by administration of fat-solubilizing concentrations of detergents in pharmaceutically acceptable formulations.

[0025] Injections using prior art formulas (phosphatidylcholine bile formulation, PBF) that combine purified phosphatidylcholine (PC) and sodium deoxycholate, a bile salt used for phospholipid solubilization, have been used to treat infraorbital fat herniation and other areas of localized fat accumulation (1-8). Based on phosphatidylcholine’s role as an emulsifier in bile and its use in the treatment of hyperlipidemia, phosphatidylcholine has been postulated as the active ingredient in PBFs (1,2,21,25-27). The detergents such as bile salts in these prior art compositions were added merely to disperse or solubilize the presumed active ingredient, PC. However, to date, there are no published reports supporting this theory. The present inventors have unexpectedly demonstrated that the bile salt was actually the active agent for localized fat emulsification.

[0026] Among detergents, bile salts are particularly potent solubilizers of lipid bilayer membranes (9,20,21,23,28). All biologic cell membranes are composed of the same bilipid structure, and are therefore subject to solubilization by detergents (10,19,34). Solubilization of cell membranes by a detergent involves distribution of the detergent between lipid bilayers, destabilization of the bilayer, disintegration, and subsequent formation of mixed micelles (composed of detergent and cell membrane lipid) (10,19,21). Bile salts, and other detergents, decrease surface tension at the border of immiscible materials and allows the breakdown of large aggregates into smaller and smaller particles. In tissue, these agents dissolve cell membranes and cause cell lysis. An inflammatory response is generated, causing the body to remove the detergent solubilized material.

[0027] For this reason, the present inventors compared sodium deoxycholate with the complete PBF using a simple, quantitative assay measuring cell viability (FIG. 2a). It is not possible to isolate and test pure phosphatidylcholine because it is insoluble in aqueous solutions unless it is combined with substances like bile salts (12). Phosphatidylcholine is highly soluble in ethanol, methanol, chloroform, and other organic solvents, yet these agents can damage lipid bilayers (29-31). In preliminary experiments, there was no difference in cell lysis and histology between pure, isolated PC and the ethanol used to dissolve it. Although benzyl alcohol, one of the components of the PC formula, has been shown to affect the fluidity of cell membranes, it is not a detergent, and therefore, its limited quantity in the formula has negligible lytic effects on cell membranes (32,33).

[0028] Because penetration into intact tissues may be likely a limiting factor, cell cultures were used to determine the dilutions of the reagents (PBF and deoxycholate) necessary to affect cells. Deoxycholate profoundly decreased the viability of cultured cells approximately equal to the complete PBF (FIG. 2a). This finding was reproduced in tissue by exposing porcine fat to PBF and deoxycholate (FIG. 3). These results support the unexpected observation that sodium deoxycholate plays a major, active role in the PBF.

[0029] A non-binding hypothesis of the present inventors was that deoxycholate and PBF affect cell viability by dis-
rupting cell membranes through detergent action. Membrane lysis in cultured cells was measured using a lactate dehydrogenase (LDH) assay and within tissue using calcein, a fluorescent marker retained in cells with intact cell membranes. The LDH assay measures the activity of LDH, which is a cytosolic enzyme released when cells are lysed. Both the PBF- and deoxycholate-treated cell cultures demonstrated a concentration-dependent increase in cell lysis (FIG. 2b). Moreover, the direct lytic effects observed in cultured cells treated with these agents suggest activity independent of endogenous lipase. Calcein was lost in the fat specimens exposed to the PBF, deoxycholate, and Triton® X-100, a known laboratory detergent (FIG. 4). This finding confirmed that disruption of cell membranes occurs in fresh tissue exposed to both the PBF and deoxycholate.

Comparing the effects of the PBF to deoxycholate in cell culture led to the surprising result that deoxycholate caused similar loss of cell viability, but less cell lysis. These differences may be concentration dependent or there may be synergistic effects between phosphatidylcholine and deoxycholate within the formula. Nonetheless, the data demonstrate that, at concentrations similar to those used clinically, deoxycholate and the PBF had similar effects on tissue histology and cell viability. Taken together, these data unexpectedly demonstrate that deoxycholate acts as the active component in the prior art PBF.

In order to illustrate the effect of detergents on tissue histology, fresh porcine skin was injected with PBF, deoxycholate, and well-characterized laboratory detergents (FIG. 5). All reagents caused significant disruption of lipocyte organization compared to PBS injection (control). These results were similarly observed within muscle and connective tissue. Rapid dissolution of cell borders by the test substances and the similarity of their effects to well characterized detergents substantiate that the PBF and deoxycholate function as detergents. The limitation with this experimental model is that it does not reveal the true sequelae that occur after injection into living tissue. It is apparent from clinical reports that a brisk inflammatory response, evident as erythema and edema, occurs after injection (1-3). Repeated inflation can potentially lead to fibrosis, especially after multiple injections. Fibrosis has been reported in several patients who developed firm nodules at injection sites after PBF administration that eventually resolve over several months (35).

Histologic findings reveal that the injectable PBF and deoxycholate alone cause architectural disruption in fat and muscle, but had no apparent affect on the epidermis, dermis, or adnexae (FIG. 5). However, Empigen® BB, a potent laboratory detergent, had profound histologic effects on dermal collagen (connective tissue). Alternatively, fat and muscle can be more sensitive to detergent treatment than these other structures at the tested concentrations (similar to those used in clinical practice).

Through a series of laboratory experiments utilizing fresh tissue specimens and cell cultures, the present inventors have demonstrated that the prior art PBF popularly used in subcutaneous injections for fat dissolution works primarily by causing non-specific lysis of cell membranes. Cell membrane are constituents of all tissue types; specifically, the present inventor demonstrated that these detergents cause solubilization of fat, muscle and connective tissue. Therefore the present inventors concluded that sodium deoxycholate, the bile salt component of the formula used to dissolve the phosphatidylcholine, was the major active ingredient of these prior art formulations. This conclusion is supported by the fact that bile salts are potent solubilizers of cell membranes. Moreover, the mechanism of the PBF and sodium deoxycholate in fat dissolution is likely detergent action.

In an embodiment of the present invention, the composition includes sodium deoxycholate and pharmaceutically acceptable excipients in an aqueous vehicle.

Suitable concentrations of sodium deoxycholate for use according to the teachings of the present invention range from approximately 0.001% to approximately 50.000%. It is understood that the final concentration is dependent on many factors known to persons skilled in the art including, but not limited to, location and size of the treatment site.

Compositions produced according to the present invention can include additional ingredients selected from dispersion agents, penetration enhancers, and preserving agents.

Pharmacologically acceptable aqueous vehicles for the compositions of the present invention can include, for example, any liquid solution that is capable of dissolving sodium deoxycholate and is not toxic to the particular individual receiving the formulation. Examples of pharmaceutically acceptable aqueous vehicles include, without limitation, saline, water and acetic acid. Typically, pharmaceutically acceptable aqueous vehicles are sterile.

Pharmacologically active detergent compositions useful in embodiments of the present invention are formulated for the non-surgical removal of localized fat deposits. As used herein, "non-surgical" refers to medical procedures that do not require an incision. Injections are examples of non-surgical procedures. Liposuction is a surgical procedure.

In one embodiment of the present invention, the composition is administered by bolus injection. In order to be effective, the composition must have direct contact with the fat tissue. The formulations can be injected subcutaneously. Formulations for injection can be presented in unit dosage form, for example, in ampoules or in multi-dose containers, with an added preservative. The compositions can take such forms as suspensions, solutions, or emulsions in oily or aqueous vehicles, and can contain formulation agents such as suspending, stabilizing and/or dispersing agents.

A "pharmaceutically acceptable excipient" means a compound that is useful in preparing a pharmaceutical composition that is generally safe, non-toxic and neither biologically nor otherwise undesirable, and includes excipients...
that are acceptable for veterinary use or human pharmaceutical use. A pharmaceutically acceptable excipient as used in the specification and claims includes both one and more than one such excipient. Some examples of suitable excipients include lactose, dextrose, sucrose, sorbitol, mannitol, starches, gum acacia, calcium phosphate, alginites, tragacanth, gelatin, calcium silicate, microcrystalline cellulose, polyvinylpyrrolidone, phosphatidylcholine, cellulose, sterile water, syrup, and methyl cellulose. The formulations can additionally include: lubricating agents such as talc, magnesium stearate, and mineral oil; wetting agents; emulsifying and suspending agents; and preserving agents such as methyl- and propylhydroxy-benzoates and benzyl alcohol. The compositions of the present invention can be formulated so as to provide quick, sustained or delayed release of the active ingredient after administration to the patient by employing procedures known in the art.

**Example 1**

**Sodium Deoxycholate and Phosphatidylcholine Formulations**

[0044] Phosphatidylcholine bile salt formulation (PBF) (5.0% highly purified soy derived PC, 4.75% sodium deoxycholate, and 0.9% benzyl alcohol, in sterile water, Table 1) was obtained from Hopewell Pharmacy, Hopewell, NJ. Sodium deoxycholate and Triton® X-100 detergent (Triton®, alkylaryl polyether alcohol) were obtained from Sigma-Aldrich Corp. (St. Louis, MO). Empigen® BB detergent (Empigen®, lauryldimethylbetaine, Calbiochem, Biosciences, Inc., La Jolla, CA). Stock reagents (5% dilutions) were prepared in PBS buffer.

[0045] The molecular structure of (a) phosphatidylcholine, (b) sodium deoxycholate and (c) benzyl alcohol are depicted in FIG. 1.

<table>
<thead>
<tr>
<th>Table 1. Injectable PBF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phosphatidylcholine</td>
</tr>
<tr>
<td>Sodium deoxycholate</td>
</tr>
<tr>
<td>Benzyl alcohol</td>
</tr>
<tr>
<td>Water</td>
</tr>
</tbody>
</table>

**Example 2**

**Effects of Sodium Deoxycholate and Phosphatidylcholine Solutions in Cultured Cells**

[0046] To measure cell viability after detergent treatment, HaCaT human keratinocyte cells were cultured in DMEM (Dulbecco’s modified Eagle’s medium) supplemented with 10% fetal calf serum, penicillin, and streptomycin. HaCaT cells were cultured in 6 well plates and incubated with 0%, 0.005%, 0.050% or 0.500% PBF (PC Formula) or sodium deoxycholate for 30 min at 37°C prior to determination of cell viability using the MTS assay, which uses a tetrazolium compound that produces a color change when bioreduced by metabolically active cells (CellTiter 96® AQUEOUS Non-Radioactive Cell Proliferation Assay, Promega, Corp. Madison, WI). Cell viability was determined by an absorbance spectrophotometer (at 490 nm) after a 4 hour incubation with the assay at 37°C. To determine cell viability in fresh tissue,
Effects of Sodium Deoxycholate and Phosphatidylcholine Solutions in Porcine Tissue

Porcine tissue was obtained immediately after sacrifice, shaved, and placed on ice for a maximum of four hours before use. Fat specimens were obtained by removing the epidermis and dermis of a punch biopsy with a scalpel and trimmed. Fat specimens were loaded with calcein dye by incubating 1 hour at 37°C with Calcein-AM (Sigma). Stock reagents were added to the fat specimens and incubated for 30 min at 37°C with gentle agitation. Calcein retention was determined by tissue fluorescence using purple (411 nm) light and visually observing the emitted green (500 nm) light using an emission filters.

Histology was performed by injecting stock reagent solutions (0.5 mL) into full thickness porcine skin at various levels (epidermis, dermis, and subcutaneous tissue) with 1.0 mL syringes and 30-gauge, 0.5 inch needles. Needle depth was visualized along the margin of the porcine tissue with the intent of saturating the target tissue. One hour after incubation with PBS at 37°C, multiple 5.0 mm biopsy specimens were obtained from the injected sites, each condition performed in triplicate. Tissue was fixed in formaldehyde, paraffin-embedded, and stained with hematoxylin-eosin. Specimens were evaluated by a board-certified dermatopathologist who was blinded to the treatment protocol.

Fresh porcine skin was used to determine if the effects of these detergent substances on cultured cells were similar in tissue. FIG. 3a demonstrates the production of dark purple pigment (indicating viable cells) in fat tissue treated with the PBS buffer (negative control) using the MTS assay. The PBF and 5% solutions of deoxycholate and Triton® detergent (positive control) demonstrated a comparable loss of purple dye (indicating cell death) in the treated fat specimens. The difference in fat cell viability between the solutions was quantified by measuring the absorbance (at 490 nm) of the supernatants collected from the treated fat specimens (FIG. 3b). All reagents had significant effects on the fat cell viability of fresh tissue.

Cell lysis was confirmed using a calcein dye release assay. Calcein becomes fluorescent after hydrolysis and is retained in cells that have intact cell membranes. Because it does not label dead cells and is lost under conditions that cause cell lysis, loss of green fluorescence in fat tissue samples loaded with the dye calcein indicates cell lysis (FIG. 4). Samples treated with the deoxycholate, PBF, and Triton® detergent (positive control) exhibited similar loss of fluorescence.

The histologic changes resulting from injection of PBF, deoxycholate, and Empigen®, are shown in FIG. 5. Phosphatidylcholine bile salt formulation (FIG. 5b) and deoxycholate (FIG. 5d) produced histologic effects similar to those caused by Empigen® (FIG. 5g) and Triton® (not shown), two well-characterized laboratory detergents. These changes were apparent in both fat and muscle. Marked blurring and dissolution of adipocyte cell membranes with disruption of its normal lobular architecture were seen after injection of both the PBF (FIG. 5b) and deoxycholate (FIG. 5d). Figure 5f demonstrates muscle fiber disarray and atrophy after PBF injection. Similar changes in muscle tissue were visible in the specimens treated with deoxycholate and the Triton® and Empigen® detergents. There were no changes in the epidermis, dermis, or adnexal structures after injection of the reagents with the exception of Empigen®, which caused loss of fibroblast nuclear staining and hyalinization of dermal collagen.

Clinical Experience with Sodium Deoxycholate Compositions

Patients having lipomas, benign, isolated collections of adipose tissue, were injected with sodium deoxycholate (DC) solutions without phosphatidylcholine directly into the lipoma. The results of this study demonstrate that the detergent effects of deoxycholate seen on fat in animal tissues are reproducible clinically in humans. All injected lipomas were visible in the specimens treated with deoxycholate and the Triton® and Empigen® detergents. There were no changes in the epidermis, dermis, or adnexal structures after injection of the reagents with the exception of Empigen®, which caused loss of fibroblast nuclear staining and hyalinization of dermal collagen.

Example 3

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Example 4

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reduced in size after at least one treatment with varied concentrations of deoxycholate (Table 2). A lipoma from one
patient, injected with 1 % DC, was excised after treatment and pathological and histological analysis performed. Within
the excised lipoma, necrosis is visible grossly (FIG. 6a) with a well demarcated area of hemorrhage and necrosis on the
lateral edge extending into the middle of the lipoma fat which contrasts with the normal lipoma fat which is lighter in
color. Histological analysis (FIG. 6b) reveals a well defined area of hemorrhage and necrotic fat as well as a significant
inflammatory reaction which contrasts to the adjacent normal round clear fat cells.

Table 2. Reduction in size of lipomas after DC treatment

<table>
<thead>
<tr>
<th>Lipoma</th>
<th>Size (cm) Pre-treatment</th>
<th>Size (cm) Post-treatment</th>
<th>Total Treatments (% DC injected)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.00 x 1.00</td>
<td>1.25 x 0.50</td>
<td>2 (2.5%)</td>
</tr>
<tr>
<td>2</td>
<td>2.00</td>
<td>1.50 x 0.50</td>
<td>3 (5% and 2.5%)</td>
</tr>
<tr>
<td>3</td>
<td>2.00 x 2.50</td>
<td>2.00 x 1.00</td>
<td>3 (5% and 2.5%)</td>
</tr>
<tr>
<td>4</td>
<td>4.00 x 3.50</td>
<td>2.50 x 2.00</td>
<td>2 (1%)</td>
</tr>
<tr>
<td>5</td>
<td>2.00 x 1.75</td>
<td>1.25</td>
<td>2 (1%)</td>
</tr>
<tr>
<td>6</td>
<td>2.80</td>
<td>0.50</td>
<td>1 (5%)</td>
</tr>
<tr>
<td>7</td>
<td>1.00 Imperceptible</td>
<td>1.00</td>
<td>1 (1%)</td>
</tr>
</tbody>
</table>

[0054] Unless otherwise indicated, all numbers expressing quantities of ingredients, properties such as molecular
weight, reaction conditions, and so forth used in the specification and claims are to be understood as being modified in
all instances by the term “about.” Accordingly, unless indicated to the contrary, the numerical parameters set forth in
the following specification and attached claims are approximations that may vary depending upon the desired properties
sought to be obtained by the present invention. At the very least, and not as an attempt to limit the application of the
doctrine of equivalents to the scope of the claims, each numerical parameter should at least be construed in light of the
number of reported significant digits and by applying ordinary rounding techniques. Notwithstanding that the numerical
ranges and parameters setting forth the broad scope of the invention are approximations, the numerical values set forth
in the specific examples are reported as precisely as possible. Any numerical value, however, inherently contains certain
errors necessarily resulting from the standard deviation found in their respective testing measurements.

[0055] The terms “a” and “an” and “the” and similar referents used in the context of describing the invention (especially
in the context of the following claims) are to be construed to cover both the singular and the plural, unless otherwise
indicated herein or clearly contradicted by context. Recitation of ranges of values herein is merely intended to serve as
a shorthand method of referring individually to each separate value falling within the range. Unless otherwise indicated
herein, each individual value is incorporated into the specification as if it were individually recited herein. All methods
described herein can be performed in any suitable order unless otherwise indicated herein or otherwise clearly contra-
dicted by context. The use of any and all examples, or exemplary language (e.g. “such as”) provided herein is intended
merely to better illuminate the invention and does not pose a limitation on the scope of the invention otherwise claimed.
No language in the specification should be construed as indicating any non-claimed element essential to the practice
of the invention.

[0056] Groupings of alternative elements or embodiments of the invention disclosed herein are not to be construed
as limitations. Each group member may be referred to and claimed individually or in any combination with other members
of the group or other elements found herein. It is anticipated that one or more members of a group may be included in,
or deleted from, a group for reasons of convenience and/or patentability. When any such inclusion or deletion occurs,
the specification is herein deemed to contain the group as modified thus fulfilling the written description of all Markush
groups used in the appended claims.

[0057] Preferred embodiments of this invention are described herein, including the best mode known to the inventors
for carrying out the invention. Of course, variations on those preferred embodiments will become apparent to those of
ordinary skill in the art upon reading the foregoing description. The inventor expects skilled artisans to employ such
variations as appropriate, and the inventors intend for the invention to be practiced otherwise than specifically described
herein. Accordingly, this invention includes all modifications and equivalents of the subject matter recited in the claims
appended hereto as permitted by applicable law. Moreover, any combination of the above-described elements in all
possible variations thereof is encompassed by the invention unless otherwise indicated herein or otherwise clearly
contradicted by context.

[0058] Furthermore, numerous references have been made to patents and printed publications throughout this spec-
ification.

[0059] In closing, it is to be understood that the embodiments of the invention disclosed herein are illustrative of the
principles of the present invention. Other modifications that may be employed are within the scope of the invention. Thus, by way of example, but not of limitation, alternative configurations of the present invention may be utilized in accordance with the teachings herein. Accordingly, the present invention is not limited to that precisely as shown and described.

References

[0060]


Claims

1. A cosmetic method of non-surgical removal of localized fat accumulation, comprising administering by injection a composition consisting essentially of sodium deoxycholate and one or more pharmaceutically acceptable excipients, wherein said composition is free of phosphatidylcholine.

2. The method according to claim 1, wherein the composition comprises sodium deoxycholate in a concentration of between 0.001% and 5%.

3. The method according to claim 2, wherein the composition comprises sodium deoxycholate in a concentration of between 0.001% and 2.5%, such as 2.5%.

4. The method according to claim 3, wherein the composition comprises sodium deoxycholate in a concentration of between 0.001% and 1%, such as 1%.

5. The method according to any one of claims 1 to 4, wherein the pharmaceutically acceptable excipient is non-toxic.

6. The method according to claim 1, wherein one of the one or more pharmaceutically acceptable excipients is benzyl alcohol and/or water.

7. The method according to any one of claims 1 to 6, wherein the composition further comprises one or more additional ingredients selected from dispersion agents, penetration enhancers, and preserving agents.

8. The method according to claim 7, wherein the one or more additional ingredients is selected from a penetration enhancer and a dispersion agent.

9. The method according to claim 8, wherein the dispersion agent is selected from hyaluronidase and collagenase.

10. The method according to any one of claims 1 to 9, wherein the composition is administered directly into fat tissue.

11. The method according to any one of claims 1 to 10, wherein the localized fat accumulation is in a human.

12. The method according to any one of claims 1 to 11, wherein the localized fat accumulation is lower eyelid fat herniation; fat accumulation on the waist or hip; xanthelasma; lipomas; lipodystrophy, including "buffalo hump" lipodystrophy; and fat deposits associated with cellulite.

Patentansprüche


2. Verfahren nach Anspruch 1, wobei die Zusammensetzung Natriumdeoxycholat in einer Konzentration von zwischen 0,001 % und 5 % umfasst.
3. Verfahren nach Anspruch 2, wobei die Zusammensetzung Natriumdeoxycholat in einer Konzentration von zwischen 0,001 % und 2,5 % umfasst, beispielsweise 2,5 %.

4. Verfahren nach Anspruch 3, wobei die Zusammensetzung Natriumdeoxycholat in einer Konzentration von zwischen 0,001 % und 1 % umfasst, beispielsweise 1 %.

5. Verfahren nach einem der Ansprüche 1 bis 4, wobei der pharmazeutisch verträgliche Arzneistoffträger nichttoxisch ist.

6. Verfahren nach Anspruch 1, wobei der eine oder die mehreren pharmazeutisch verträgliche(n) Arzneistoffträger Benzylalkohol und/oder Wasser ist/sind.

7. Verfahren nach einem der Ansprüche 1 bis 6, wobei die Zusammensetzung ferner einen oder mehrere Inhaltsstoff(e) umfasst, der/die ausgewählt ist/sind aus Dispersionsmitteln, Durchdringungsstärkern und Konservierungsstoffen.

8. Verfahren nach Anspruch 7, wobei der eine oder die mehreren zusätzlichen Inhaltsstoffe ausgewählt ist/sind aus einem Durchdringungsverstärker und einem Dispersionsmittel.

9. Verfahren nach Anspruch 8, wobei das Dispersionsmittel ausgewählt ist aus Hyaluronidase und Kollagenase.

10. Verfahren nach einem der Ansprüche 1 bis 9, wobei die Zusammensetzung direkt in das Fettgewebe verabreicht wird.

11. Verfahren nach einem der Ansprüche 1 bis 10, wobei die lokalisierte Fettanhäufung in einem Menschen besteht.

12. Verfahren nach einem der Ansprüche 1 bis 11, wobei es sich bei der lokализierten Fettanhäufung um eine Augenfetthenhmation; eine Fettanhäufung an der Taille oder den Hüften; Xanthelasma; Lipomen; Lipodystrophie, einschließlich einer Buckel-Lipodystrophie; und Fettablagerungen, die mit Cellulitis assoziiert sind, handelt.

Revendications

1. Procédé cosmétique pour l’enlèvement non chirurgical d’une accumulation localisée de graisse, comprenant l’administration par injection d’une composition composée essentiellement de désoxycholate de sodium et d’un ou de plusieurs excipients pharmaceutiquement acceptables, dans lequel ladite composition ne contient pas de phosphatidylcholine.

2. Procédé selon la revendication 1, dans lequel la composition comprend du désoxycholate de sodium dans une concentration allant entre 0,001 % et 5 %.

3. Procédé selon la revendication 2, dans lequel la composition comprend du désoxycholate de sodium en une concentration allant entre 0,001 % et 2,5 %, telle que 2,5 %.

4. Procédé selon la revendication 3, dans lequel la composition comprend du désoxycholate de sodium en une concentration allant entre 0,001 % et 1 %, telle que 1 %.

5. Procédé selon l’une quelconque des revendications 1 à 4, dans lequel l’excipient pharmaceutiquement acceptable est non toxique.

6. Procédé selon la revendication 1, dans lequel l’un parmi l’un ou plusieurs excipients pharmaceutiquement acceptables est l’alcool benzylique et/ou de l’eau.

7. Procédé selon l’une quelconque des revendications 1 à 6, dans lequel la composition comprend également un ou plusieurs ingrédients supplémentaires choisis parmi des agents de dispersion, des agents facilitant la pénétration et des agents de conservation.

8. Procédé selon la revendication 7, dans lequel l’un ou les plusieurs ingrédients supplémentaires sont choisis parmi un agent facilitant la pénétration et un agent de dispersion.
9. Procédé selon la revendication 8, dans lequel l’agent de dispersion est choisi parmi l’hyaluronidase et la collagénase.

10. Procédé selon l’une quelconque des revendications 1 à 9, dans lequel la composition est administrée directement dans le tissu graisseux.

11. Procédé selon l’une quelconque des revendications 1 à 10, dans lequel l’accumulation localisée de graisse est chez un humain.

12. Procédé selon l’une quelconque des revendications 1 à 11, dans lequel l’accumulation localisée de graisse est une hernie graisseuse de la paupière inférieure ; une accumulation de graisse sur la taille ou les hanches ; un xanthélasme ; des lipomes ; une lypodystrophie comprenant une lypodystrophie en « bosse de bison » et des dépôts graisseux associés à la cellulite.
FIG. 1

A

$\text{CH}_2\text{OR}_1$

$\text{CHOSR}_2$

$\text{CH}_2\text{O-PO(CH}_2\text{CH}_2\text{NCH}_3^+\text{CH}_3}$

$\text{O}^{-}\text{CH}_3$

$R_1, R_2 = \text{Fatty Acid Residues}$

B

C

$\text{CH}_2\text{OH}$
FIG. 2a

FIG. 2b
FIG. 4
FIG. 6a

FIG. 6b
REFERENCES CITED IN THE DESCRIPTION

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