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## UFASOMES: AN EMERGING VESICULAR SYSTEM FOR FUTURISTIC DRUG DELIVERY APPLICATIONS

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## ABSTRACT

Aqueous compartments in vesicular drug delivery devices are covered by one or more concentric bilayers made up of amphiphilic molecules. They are an excellent distribution method for targeted medication delivery due to their ability to localise drug activity to the site or organ of action. The vesicular drug delivery method keeps the drug action going at a constant rate. As a consequence, the body's opioid frequency is maintained while the negative side effects are reduced. Ufasomes are vesicles composed of unsaturated fatty acids. They are pH-controlled suspensions of closed lipid bilayers made composed of fatty acids and their ionised species (soap). The lipid film hydration procedure is often used to create fatty acid vesicles. Oleic acid is the most common fatty acid utilised to make ufasomes. This article discusses ufasomes' advantages, disadvantages, future development, and categorization.

**KEYWORDS:** Vesicular Drug Delivery System, Ufasome, Development, Fatty Acid Vesicles, Applications, Characterization.

## INTRODUCTION

When an evaporated film is physically agitated in the presence of a buffer solution, ufasomes form. They are vesicles made up of long-chain unsaturated fatty acids. Colloidal suspensions of fatty acids and their ionised forms are referred to as fatty acid vesicles. It's a good way to get medicines to the infection site quickly, with reduced opioid toxicity and side effects. The development of vesicular systems such as liposomes has been explored as a way to localize medicine at the site of action and enhance the penetration of the biologically active component into the tissue. Liposomes include phospholipids as its main component. Natural phospholipids are chemically diverse, and pure synthesized phospholipids aren't currently available in significant quantities. The availability of fatty acids is a major advantage of ufasomes over liposomes. Fatty acid vesicles may be formed by unsaturated fatty acids such as oleic and linoleic acid, as well as saturated fatty acids such as octanoic and decanoic acid.

The skin is a well-known route for getting bioactive chemicals to specific locations. Because it acts as a physical barrier between the body and the outside environment, opioid penetration via this route is challenging. In the top layers of the skin, the stratum corneum, this is made up of corneocytes surrounded by lipid areas, serves as the main physical protection. A number of penetration enhancers may be employed to ensure that topical drugs are distributed effectively. The main aim of injecting medicines into the skin for the treatment of skin disorders is to produce local effects at or around the injection site. Traditional formulations, such as creams, gels, and ointments, suffer from dermatopharmacotherapy, which is a concern (limited local activity). The formation of vesicular structures such as liposomes, niosomes, and ufasomes has been studied as a way to enhance the penetration of the bioactive component into the skin and further localise the medicine at the site of action.

Ufasome is a new way to improve opioid absorption through the skin. Unsaturated fatty acids like linoleic and oleic acids are utilized as natural permeability enhancers in the manufacturing of ufasomes. Surfactant is often used with fatty acids to improve skin flexibility and

medication transport through the skin membrane. For a long period, ufasomes enhanced medicine retention characteristics inside the skin cell membrane.

Ufasomes are little fatty acid vesicles. Membrane fatty acids' hydrocarbon tails are oriented towards the membrane interior, while their carboxyl groups are in contact with water, creating a bilayer structure. Ufasomes are soapy suspensions of closed lipid bilayers composed mainly of fatty acids. They usually remain within a pH range of 7 to 9 in nature.[1]

### Advantages
1. Increases the amount of time a drug spends in systemic circulation while lowering toxicity.
2. Because the medicine is delivered directly to the source, it may be absorbed selectively.
3. Improves bioavailability, particularly for poorly soluble medicines.
4. Hydrophilic or lipophilic medicines may be incorporated into ufasomes.
5. Delays the removal of rapidly metabolizable substances, acting as a continuous release mechanism.
6. The chemical will rapidly penetrate if administered topically.
7. Ufasomes are less expensive than liposomes and niosomes because fatty acids are widely available.
8. The entrapment quality of the medication is satisfactory.[2]

### Generalized Way of Formation
Only non-oxidized materials are utilised to make ufasome. At 20°C, stock solutions of oleic and linoleic acids in chloroform with 10% oleic and linoleic acids are prepared and processed. In most preparations, 0.02 ml of the stock solvent is evaporated in a test tube using a water pump and then dried with a spray of nitrogen. The fatty acid layer is completely broken up in 0.2 ml of 0.1 M tris-hydroxymethyl aminomethane buffer, pH 8–9. This method creates ufasome suspensions that are stable for at least 24 hours. Particles are produced in certain experiments utilizing an ultrasonic generator with a titanium microtip. Nitrogen current is utilized to evacuate air from the buffer during irradiation, and the suspension is blanketed with the gas. An ice bath may assist maintain a consistent temperature. [3]

### Methods of Preparation
### Thin Film Hydration Method
In this mechanism, vesicle formation happens across a narrow pH range. In a flask with a circular rim, fatty acid is combined with an organic solvent. A high fatty acid concentration is required for this technique. Before the organic solvent has completely evaporated, the liquid is vaporised. Finally, a thin fatty acid layer is created and hydrated using a pH-appropriate buffer.

### By Addition of Alcohol
Fatty acid vesicles are formed in this method by adding an alcohol with the same chain length as the fatty acid. The primary advantage of this method is that the fatty acid vesicles are stable over a wide pH range. Vesicle formation may be increased in the presence of pre-added fatty acid vesicles and liposomes. Because this procedure takes a long time to perform, this method saves time.

### Autopoetic Process
When an aqueous fatty acid solution is introduced to a water-buffered solution, fatty acid vesicles form as a result of the random pH change. It is possible for vesicles to form when half of the carboxylic acids in a fatty acid ionise. The hydrocarbon chain creates a bilayer arrangement opposing the aqueous compartment, decreasing water interaction.[4]

### Key Issues in Manufacturing of Ufasomes
### Selection of fatty acid
Based on analyses of natural membrane phospholipids and information from pressure region measurements on fatty acid surface films, 12 to 22 carbon fatty acids seem to be suitable for the creation of stable ufasomes. In fact, the bulk of the study was focused on C-18 acids since they showed the greatest promise in early tests. Only oleic acid (cis-9-octadecenoic acid) and linoleic acid (cis-9,12-octadecenoic acid) can form membranes, allowing ufasomes to meet these criteria. Palmitic acid may be tolerated up to 33% by weight in an oleic acid membrane, whereas stearic acid can be tolerated up to 5%. Charged membranes containing low amounts of oleic, linoleic, or stearic acid amides had little effect on the preparations. According to stability tests, oleic acid remained free of peroxide contamination for at least 6 weeks, whereas linoleic acid produced significant peroxide within 2–3 weeks.

### Addition of cholesterol
In lipid vesicles, cholesterol has a unique ability to regulate membrane fluidity, elasticity, and permeability. It basically fills in the gaps left by incomplete packing of other lipid molecules. The capacity of vesicles to hold solute decreases quickly in the presence of increased cholesterol levels. In addition, at whatever cholesterol content, there is no increase in membrane impermeability. Researchers compared glucose leakage from ufasomes with 17% integrated cholesterol to leakage from spheres with 17% incorporated cholesterol. Glucose leakage from vesicles containing 17% additional cholesterol was shown to be greater than glucose leakage from cholesterol-free oleic and linoleic acid ufasomes, according to their results.

### pH
Only a particular pH range (7–9), when approximately half of the carboxylic groups are ionised, may cause fatty acid vesicles to form. Below this range, fatty acids form unstructured precipitates, while beyond it, they are excessively soluble. The oleic acid/oleate technique

titration curve will differentiate three areas for micelle, vesicle, and oil droplet production at an 80 mM total concentration. Micelles (aggregation species with a greater ratio of ionised to protonated molecules) are the most common aggregation species at higher pH, while oil droplets develop at lower pH. Fatty acid vesicle systems are considerably easier to identify at concentrations just slightly higher than the essential vesiculation concentration, or CVC, at which vesicle production is seen. At the necessary vesiculation concentration, monomers and non-vesicular aggregates combine to produce colloidal vesicle suspensions in a bilayer structure. It's also worth mentioning that diluting a fatty acid micellar solution to neutral pH causes vesicles to form in a random pattern with a wide size range.

### Selection of buffer
A frequently used ufasome preparation buffer is tris hydroxymethyl aminomethane. On the other hand, spheres are formed by borates, glycine-hydroxide, and bicarbonate solutions. The buffer used depends on the kind of solute to be incorporated. For example, ufasomes produced in bicarbonate did not retain glucose in vesicles, while borate preparations could not be tested for retention owing to the formation of a glucose buffer complex. To make ufasomes from 1 mg of fatty acid, 0.1 ml of 0.1 M tris at pH 8 is required.

### Electrolyte
Most electrolytes prevent the formation of ufasomes. After stabilizing the spheres in the appropriate buffer, they may be exposed to phosphate or chloride solutions while maintaining the occluded glucose.

### Peroxidation
Peroxidation disrupts the normal bilayer structure of fatty acid molecules, which has a major effect on ufasome membranes. The hydrophobic membrane interior will be deformed by peroxidation of a bulky hydrophilic group, allowing water-soluble molecules to move more readily. The manner of preparation may have a big impact on how much fatty acid peroxidation occurs. Peroxidation did not develop during the short time required for hand vortexing. Linoleic acid oxidised 0.1% per minute in air-saturated buffers after being exposed to 30-W irradiations during a more vigorous ultrasonic resuspension. Even though the maximum exposure duration was 3 mins, this method could not produce significant oxidation of oxidation sensitive linoleic acid. However, nitroxide radicals, butylated hydroxytoluene, and α-tocopherol were shown to resist linoleic acid membrane peroxidation, according to Hicks and Gebicki.

### Divalent cations
Lipid peroxidation involves both enzymatic and nonenzymatic catalytic processes (LPO). Transition metal ions are very important in non-enzymatic lipid peroxidation. Only a few metals with a valency change that only requires one electron transfer promote rapid peroxidation in unsaturated lipids. Non-variable valence state metals including calcium, magnesium, and zinc, which are incapable of redox-coupled homolysis, have been found to affect lipid peroxidation. Calcium ions have a biphasic effect on LPO, which means they may stimulate as well as inhibit it. The biphasic action of calcium in liposomes (produced from egg yolk lecithin) and ufasomes was investigated by the researchers (from linoleic acid and methyl linolenate). LPO in liposomes and ufasomes was induced in the presence of ascorbate or hydroperoxide, as well as Fe. Ca caused LPO in lipids by interfering with negatively charged lipid groups (phosphate groups of lecithin, carboxyl groups of linolenic acid), displacing bound Fe ions and increasing the concentration of free Fe ions, which are directly involved in LPO catalysis, at low concentrations. The interaction of Ca with superoxide anion radicals at high concentrations was required for its inhibitory effect. Other cations with a high charge density may also release Fe ions linked to negatively charged lipid groups and react with superoxide free radicals, thus this biphasic impact on LPO is not limited to Ca ions. Adding La ions to linolenic acid ufasomes at a concentration equal to Fe ions activated LPO in the absence of Ca ions. There was an effect of prevention of linolenic acid peroxidation on the combined action of equimolar Ca and La concentrations (where their total concentration exceeded that of Fe).[5]

### Characterization of Ufasome
### Particle Size and Size Distribution
A particle size analyzer is utilized at a fixed angle of 90° and at 25° to assess the average diameter and size distribution of ufasome suspensions using Photon Correlation Spectroscopy. After being diluted with phosphate buffer, the suspensions were passed over a polycarbonate membrane (pH 7.4). This is done to minimize particulate matter interference till sizing.

### Shape and Surface Morphology
The morphological characteristics of sphericity and the accumulation of drug-loaded ufasomal dispersion may be examined using transmission electron microscopy (TEM). On a carbon film-covered copper grid that has been negatively stained with 1% phosphotungstic acid, one drop of the selected ufasomal dispersion may be tested. Before being examined by TEM, the sample is allowed to dry for 10 mins at room temperature.

### Differential Scanning Calorimetry
Differential Scanning Calorimetry is utilized to determine the physical state of the material contained inside the oleic acid vesicles. The vesicles were placed in a conventional aluminum pan and scanned at a rate of 2°C/min.

### Entrapment Efficiency
To assess the drug's entrapment efficacy, ultracentrifugation at 25000 rpm for 3 hrs at 4°C may be employed. The entrapment effectiveness of the

supernatant may be measured using UV spectroscopy. The volume of the entrapped medication as a percentage may be calculated using the following calculation:

**Entrapment efficiency (%)** = (Amount of drug added initially - Amount of drug determined in the filtrate spectrophotometrically) / Amount of drug added initially × 100

### *In Vitro* Drug Release

The goal of this study is to figure out how fast a medication releases from ufasomes and what its release kinetics are. This may be done using Franz diffusion cells. There are two compartments in the Franz diffusion cell: one for the donor and one for the receptor. A polycarbonate membrane with pore sizes of 50 nanometers separates these two compartments. The donor compartment contained 1 ml of ufasomal dispersion, whereas the receptor compartment contained phosphate-buffered saline (PBS), pH 7.4, which was kept at 37°C and stirred at a constant rate using a magnetic stirrer. Aliquots of samples are withdrawn and replaced with equal quantities of fresh PBS at predetermined intervals (pH 7.4).[6]

### pH-Dependent Stability

By incubating optimized vesicular dispersion with buffers of pH 8.5, 7.4, 6.5, and 5.5, the effect of pH on stability and drug release activity was investigated. The samples are taken at predetermined intervals and centrifuged at 14,000 rpm for 30 minutes. The free medicine generated may be tested using the supernatant. To determine the amount of medication that has been leached, utilize the following technique:

**% Drug diffused** = Amount of free drug / Total drug × 100

### Dynamic Nature Of Ufasomes

Because fatty acid vesicles are built up of single-chain amphiphiles, one of its most distinguishing features is their intricate structure. By their dynamic characteristics, fatty acid vesicles differ from conventional vesicles composed of double-chain amphiphiles and micelles built of single-chain surfactants. The fact that the terminal carboxylic acid's protonation/ionization ratio may be altered to produce a variety of fatty acid aggregates. Researchers are looking on the formation kinetics of ufasome. The formation kinetics of micelles and vesicles from a saturated fatty acid/soap monomer solution were compared by dialyzing fatty acid/soap monomers across a cellulose acetate membrane. Starting with an asymmetric distribution of fatty acid/soap molecules between two chambers separated by a dialysis membrane, one containing aggregates (micelles or vesicles) and the other containing just the buffer solution, the rate of attainment of equilibrium was determined. The diffusate chamber produced micelles, and the fatty acid/soap contents in both chambers were the same. In the case of vesicles, however, achieving an equilibrium state was substantially hindered (the concentration in the diffusate increased very slowly after the solution was saturated with monomers). Vesicles have a significantly greater concentration of amphiphiles than micelles. Producing fatty acid vesicles has a far greater energy barrier than forming fatty acid micelles, according to the results of dialysis experiments using fatty acid vesicles. A basic technique for creating fatty acid vesicles is to mix an alkaline soap solution with an intermediate pH buffer solution. When a condensed solution of sodium oleate micelles is added to a pH 8.5 buffered solution, oleic acid/sodium oleate vesicles form spontaneously owing to partial protonation of the oleate molecules caused by the pH drop from approximately 10.5 to 8.5. Vesicles generated are polydisperse in terms of size and lamellarity. Fatty acid vesicles develop spontaneously when alkaline micelles are added to buffered vesicles.[7]

### Stability Consideration in Ufasome Formulation

For the long-term survival of ufasome membranes, a reduction in the free energy of the fatty acid-water system is essential. The membrane does not spontaneously develop because the acids begin a separate phase at pH 8. Even moderate mechanical agitation may promote bilayer formation under the proper circumstances. A significant portion of the energy released in this phase is due to the increased entropy of water as a consequence of the hydrophobic interactions of the directed hydrocarbon chains. The attractive contact is reversed in the bilayer due to mutual repulsions of the ionised carboxyl head groups. Fatty acid films' durability is reduced by electrolytic dissociation, which may lead to rupture. By reducing the degree of head group dissociation, creating stable complexes between protonated and ionized carboxyl headgroups, or decreasing the degree of head group dissociation, the presence of screening counter ions reduces charge repulsion. Ufasome membrane stability may be aided by any of these mechanisms. The reduction of lateral charge repulsions occurs when the pH at the particle surface is lowered, which is helpful to membrane stability. Ionization decreases membrane stability in several instances. To begin with, protonated molecules are almost insoluble in water, in contrast to anions. Second, lateral headgroup repulsion is decreased; when the second charge is removed from a film of densely packed headgroups, the average distance between charges increases by around 40%, halving columbic repulsions. Third, protonated acid molecules and anions create a series of tightly bonded complexes, with a 1:1 complex being the most common. The energy for binding is made up of free energy changes caused by hydrophobic contacts, the entropy of demixing associated with dimer formation, and a free energy decrease caused by hydrogen bond creation between protonated and ionized carboxyl groups. Studies of interactions in dicarboxylic acids have shown that extremely strong hydrogen bonds form between the COOH and COO groups due to the presence of a negative charge near the hydrogen implicated in bonding. The stability of ufasome membranes is caused

by headgroup hydrogen bonding with water, complex formation of ionized and neutral acid molecules, and hydration of dissociated carboxyl groups. Furthermore, the same dispersion and hydrophobic associations that bind micelles and membrane interior regions also bind fatty acid hydrocarbon areas.[8]

## Microscopic Studies

The arrangement of biological membrane components such as fatty acids and phospholipids was revealed by electron microscopy of sectioned vesicular structures. However, it was widely assumed that the necessary fixing and staining required strong chemicals, which may cause deformation of these delicate structures, leading to loss of definition and the fabrication of objects. To alleviate such concerns, less abrasive techniques may be employed. One of the most successful methods for dealing with natural components is freeze-fracture. The method of detecting birefringence is much gentler. Negatively stained specimens used to study the structure of the ufasome did not survive the preparation procedures, according to electron microscopy. Both efforts to use neutralized potassium phosphotungstate to stain ufasomes for electron microscopy failed to produce specimens with any interior structure.

## Freeze fracturing and etching

The ufasome suspension is then frozen after being equilibrated for 10 minutes with 17% glycerol. After that, the ufasome suspensions are rapidly frozen in Freon-filled copper helmets and then kept under liquid nitrogen. In a Balzers microtome, fracturing occurs at $110°C$ at $2 \times 10^{-6}$ Torr pressure. Etching takes place at a temperature of $100°C$ for 1 minute. Following cutting, a 3 nm coating of platinum and carbon is deposited at a $45°$ angle on the fracture face. Floating replicas off the metal helmet into water, which is then combined with methanol until the solution is 80% alcohol, is the most effective method of cleaning them. In less than 30 mins, both fatty acid indications were gone. The copies are then tested using a Hitachi HS8 electron microscope. According to the researchers, there was no difference in the appearance of ufasomes made from oleic or linoleic acids. Due to the high %age of water in ufasome preparations, ice made up a large part of the freeze broken face, which had a very uneven surface. Etching the surface, particularly if the ufasomes had been pre-equilibrated in glycerol, resulted in a clear separation of ice and particle surface. The fatty acids' exposed outer and inner surfaces are smooth, while the underlying ice is often grainy. The space between the membranes is also rough, indicating that it was previously flooded.

## Birefringence

The difference in birefringent particle frequency may be explained by the significant variety in inter-membrane lengths observed in ufasomes. The intrinsic variable of the several kinds of birefringence observed in multi-lamellar particles is usually positive or negative in symbol. A positive sign component is produced by lipid molecules aligned perpendicularly to the membrane surface, while a negative "form" component is produced by adjacent membranes aligned parallelly. As the distance between neighbouring membranes widens, so does the degree of birefringence. Freeze-etched ufasome preparations showed that irregular multi-membrane particles or large water-filled spheres are significantly more typical than symmetrical particles with strong birefringence.[9]

## Recent Innovations in Conventional Ufasomes

Ufasome applications in medication delivery are mostly unexplored due to concerns regarding carboxylic acid vesicles' colloidal stability. Several recent studies have demonstrated, however, that utilizing novel forms of fatty acids or blended structures of various surfactants may improve medication dispersion.

## New Type of Fatty Acids

Between pH 8.5 and 9, the fatty acid cis-4,7,10,13,16,19-docosahexaenoic acid (DHA) self-assembles into vesicles.

## Extension of The pH Range

A narrow pH range is generally optimal for the formation of fatty acid vesicles since approximately half of the carboxylic acid must be ionized. However, by using the following new methods, the pH spectrum may be expanded.

**a)** *Amphiphilic additives, such as linear alcohols or a surfactant containing a sulfate or sulfonate head group*
Vesicles are made using decanoic acid and decanoate type combinations at pH 6.4 to 7.8, but the pH may be lowered to at least 4.3 by adding sodium dodecylbenzene sulfonate (SDBS).

**b)** *Alter the scale of the hydrophilic head group of fatty acids synthetically*
It has been shown that fatty acids containing an oligo (ethylene oxide) unit intercalated between the hydrocarbon chain and the carboxylate head group enhance vesicle stability at lower pH. A large polar community has two effects: it reduces the phase transfer temperature and the pH range in which vesicles may develop.

## Insensitivity toward Divalent Cation

Divalent cations like Mg and Ca cause vesicle precipitation even at low concentrations. To stabilize fatty acid vesicles in the presence of ionic solutes, fatty acid glycerol esters may be added.

## Enhancement of Stability by Cross-linking Fatty Acid Molecules by Chemical Bonds

A polymerizable fatty acid (e.g., sodium 11-acrylamidoundecanoate: SAU) may be employed to enhance the consistency. It was found that polymeric SAU vesicles self-assemble into vesicular aggregates and are stable at high temperatures.

## Mixture of Fatty Acid Vesicle and Surfactant-Based Vesicles

A model framework for mixed vesicles consists of tetradecyltrimethylammonium hydroxide (TTAOH) and fatty acids. When approximately equal quantities of TTAOH and fatty acid were mixed, unilamellar and multilamellar vesicles resulted. [10]

## Application of Ufasomes

Drug-loaded ufasomes may be used to administer a variety of therapeutics transdermally. Transdermal distribution has been utilized for anti-inflammatory, antifungal, anti-osteoarthritic, anti-cancer, and other medicines loaded in ufasomes.

## Anti-fungal Drugs

To overcome the drawbacks of conventional formulations such as allergic responses and low penetration capability, novel formulations such as niosomes, liposomes, ethosomes, microemulsions, and micelles have been developed for transdermal delivery of these medicines. Ufasomes are more advanced gadgets that are especially developed for this purpose. The drug released from the ufasomal dispersion was maintained according to an in-vitro drug release study. In vivo testing confirmed a five-day drug release from ufasomes. This indicates that, unlike other commercially available formulations, it is suitable for long-term treatment.

## Anti-cancer Drugs

5-fluorouracil (5-FU) has been approved for use as a topical treatment for basal cell carcinoma by the United States Food and Drug Administration (BCC). The marketed formulation has been linked to itching, eczema, redness, and a lack of skin penetration. ufasomes are utilised to minimise side effects since the medicine is encapsulated inside the vesicles. They have the potential to boost opioid penetration while also delaying medication delivery. In the refrigerator, the fatty acid vesicles were mostly undamaged. According to ex-vivo skin penetration experiments, the fatty acid vesicles penetrated the stratum corneum and stored the material in the epidermal layer.

## Anti-inflammatory Drugs

The initial step of rheumatoid arthritis (RA) treatment is the use of non-steroidal anti-inflammatory medicines (NSAIDs). In order to prevent or limit joint damage, slow-acting disease-modifying anti-rheumatic medications (DMARDs) have lately been suggested for the early treatment of RA. The amount of medication penetrated through rat skin was three to four times higher when fatty vesicles were utilized instead of a basic drug solution or carbopol gel. A skin penetration test shows that up to 50% of the given dose of fatty acid vesicles is detected in the skin when they are utilized. As a consequence, using this technique may assist in reducing RA inflammation. The transdermal penetration was found to be 4.7 times higher when fatty acid vesicular gel was combined with pure medication gel. There was a substantial reduction in edema when the fatty acid vesicular gel was used in conjunction with the same amount of commercial product. As a consequence, medicine gels based on fatty acid vesicles may be more effective than currently available gels in treating inflammation.

## Anti-osteoarthritic drugs

Collagen and proteoglycans, which are present in the human body, are essential for joint reconstruction and the generation of synovial fluid, which lubricates joints. Supplementing with glucosamine encourages the body to produce more of them. As a result, glucosamine has long been advocated for the treatment of osteoarthritis. As a consequence, fatty vesicles of glucosamine sulfate are packed and distributed in carbopol gel for topical distribution to treat osteoarthritis. The medication concentration in the vesicle-based gel was 6-fold greater in rats than in the basic carbopol gel. The medication was also regularly published on a fatty acid vesicle gel. As a result, this formulation may be utilized as a depot therapy for osteoarthritis.[11]

## CONCLUSION

Ufasomes are fatty acid-based suspensions with a pH range that is restricted. In ufasomes, fatty acid molecules' hydrocarbon tails are oriented against the membrane interior, while their carboxyl groups are in contact with water. Factors including fatty acid choice, cholesterol level, buffer, pH variation, and others influence the stability of ufasome formulation. Ufasomes have a lot of potential in terms of medicine, and they may be utilized to treat a variety of skin conditions. Swelling, itching, and other allergic responses on the skin may be reduced since the medicine is released in a controlled or delayed manner. Fatty acid vesicles have also been proven to be especially useful in the treatment of skin disorders in illnesses like AIDS due to the controlled release of the medicine. Ufasomes are regarded a superior option to liposomes for topical drug administration due to their cheaper cost, rapid penetration capacity, and excellent entrapment performance.

## CONFLICTS OF INTEREST

No conflict of interest is declared.

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