Transdermal Drug Delivery - Technologies, Markets, and Companies

Description: This report deals with transdermal drug delivery - an approach used to deliver drugs through the skin for therapeutic use as an alternative to oral, intravascular, subcutaneous and transmucosal routes. Various transdermal drug delivery technologies are described including the use of suitable formulations, carriers and penetration enhancers. The most commonly used transdermal system is the skin patch using various types of technologies. Nanoparticles as well as the use of physical agents to facilitate transcutaneous drug delivery is described.

Microneedle and needleless technologies are also described. Transdermal technologies may be applied for several categories of pharmaceuticals used for the treatment of disorders of the skin or for systemic effect to treat diseases of other organs. Several transdermal products and applications include hormone replacement therapy, contraception, management of pain, angina pectoris, smoking cessation and neurological disorders such as Parkinson's disease. The market for transdermal drug delivery is analyzed according to technologies and therapeutic areas from 2016 to 2026. This market is analyzed according to geographical regions as well.

Benefits of this report:

- Up-to-date one-stop information on transdermal drug delivery
- Description of 111 companies involved and 111 collaborations in this area
- Market analysis 2016-2026/
- Market values in major regions
- Strategies for developing markets for transdermal drug delivery
- A selected bibliography of 220 publications
- Text is supplemented by 22 tables and 15 figures

Who should read this report?

- Biotechnology companies developing transdermal technologies
- Drug delivery companies
- Pharmaceutical companies interested in transdermal drug delivery
- Pharmaceutical research institutes

The report includes information on the following areas:

- Basics of Transdermal Drug Delivery
- Transdermal Drug Delivery Technologies
- Transdermal Therapeutics
- Markets for Transdermal Drug Delivery
- Companies involved in transdermal drug delivery

Contents:

0. Executive Summary

1. Basics of Transdermal Drug Delivery
   - Introduction
   - Historical landmarks in transdermal drug delivery
   - Anatomy and physiology of skin
   - Skin metabolomics and transcutaneous passage of drugs
   - Transcutaneous absorption
   - Transdermal versus other methods of drug delivery
   - Advantages of transdermal drug delivery
   - First-Pass Effect
   - Drawbacks of transdermal delivery
   - Factors that influence transdermal drug delivery
   - Rate of permeation across the skin
Properties of the skin
Properties of drugs
The role of pH and pharmacokinetics
Intradermal disposition of drugs after topical application
Role of nanobiotechnology in understanding basis of transdermal delivery

2. Transdermal Drug Delivery Technologies
Introduction
Local application formulations
Crystalline topical formulations
Microemulsions for transdermal drug delivery
Nanoemulsions for transdermal drug delivery
Transdermal gel technology
Biphasix system
Penetration enhancers
Chemical enhancers
Nitric oxide-based transdermal drug delivery
Ionic liquids for transdermal delivery of drugs against bacterial biofilms on skin
Vesicular transdermal carriers
Liposomes
Transfersomes
Ethosomes
Elastic vesicles for transdermal drug delivery
Nano vesicles for transdermal drug delivery
Transdermal patches
Adhesives for transdermal patches
Commercial development of transdermal patches
Innovations in transdermal patches
e-Patch™ controlled release micropump system
Patchless Transdermal Delivery System
Metered-dose transdermal system
Polymers for transdermal drug delivery
Polymer membranes in transdermal patches
Film forming polymeric solutions
Use of physical modalities to facilitate transdermal transport
Transdermal electrotransport
Drug delivery by electroporation
Cryoelectrophoresis
Iontophoresis
Iontophoresis compared with electrophoresis
Application of iontophoresis for drug delivery
Patents in iontophoresis
Companies with technologies for drug delivery by iontophoresis
Combination of electrophoresis and iontophoresis
Dermaportation
Radiofrequency-driven transdermal delivery
Microporation
Transcutaneous drug delivery by electropulsation
Companies involved in electroporation-based drug delivery
Electrode Scanning System
Use of electrostatic force in skin patch technology
Multiple Absorption Kinetic System
Transdermal drug delivery facilitated by heat
Controlled, heat-aided drug delivery
Ultrasound
Magnetophoresis
Use of lasers for transdermal drug delivery
Laser-induced microporation
Transdermal drug delivery by laser-induced pressure waves
Transdermal drug delivery by laser-assisted changes in skin
Transdermal delivery by gas under pressure
Transdermal delivery with Powderject gas gun
Microscission induced by gas
Role of microelectronics in transdermal drug delivery
Microneedles and dermal microinjection technologies
Applications of microneedles
AdminPatch® microneedle array
Biodegradable microneedles
Ceramic microneedle arrays
Dissolvable microneedle patches
MicorCor
Microneedle arrays for drug delivery
Microneedle patch
MicroPyramid™ microneedles
Microstructured Transdermal Systems
Microneedle Array Patch technology
Microneedle transdermal chip
Microneedle applicator device
Nanoject™ microneedle technology
PatchPump
Polymer microneedles
Silk microneedles
Tattooing for drug delivery
ZP Patch microprojections technology
Companies developing microneedles for transdermal drug delivery
Needlefree injections
Glide SDI® solid dose injector
Jet injection
Mini-Ject needlefree delivery system
Microjet for painless injections
Nanoliter-volume pulsed microjets
SUMAVEL™ DosePro™ needle-less injection
Skin ablation or abrasion for drug delivery
Nanotechnology-based transdermal drug delivery
Delivery of nanostructured drugs from transdermal patches
Effect of mechanical flexion on penetration of bucky balls through the skin
Nanobiotechnology for transdermal application
Nanoparticles and nanoemulsions for skin disorders
Nanopatches
Inocyte™ epidermal drug delivery system
Ionic nanoparticle technology
SLN gel for treatment of skin disorders
Topical delivery of siRNA- nanoparticle conjugates
Transdermal nanoparticle preparations for systemic effect
Transferosomes for transdermal drug delivery
Transdermal administration of nanocarriers
Nanotechnology-based transdermal vaccination and immunotherapy
Safety issues of applications of nanomaterial carriers on the skin
Comparison of transdermal drug delivery systems
Transdermal drug design
In vitro testing of transdermal drug delivery systems
Commercially available skin models for transdermal drug testing
FDA guidelines for post-approval changes in semisolid topical drugs
In vivo testing of drug delivery systems
Infrared spectroscopy for evaluation of transdermal drug delivery
Modeling of transport through the skin
Concluding remarks on transdermal drug delivery technologies
Future developments in transdermal drug delivery

3. Transdermal Therapeutics
Introduction
Drugs that can be administered transdermally
Approved transdermal products
Drugs in clinical trials
Skin disorders
Cutaneous leishmaniasis
Hair loss
Iontophoretic drug delivery for nail disorders
Psoriasis
Nanoemulsions for paclitaxel delivery in psoriasis
Iontophoresis for treatment of psoriasis
Cardiovascular disorders
Transdermal estrogen for prevention of atherosclerotic cardiovascular disease
Transdermal drug delivery for angina pectoris
Transdermal drug delivery for hypertension
Transdermal clonidine
Transdermal delivery of β-blockers for hypertension
Transdermal delivery of calcium channel blockers for hypertension
Transdermal drug delivery for congestive heart failure
Transdermal beta blockers
Transdermal anticoagulants
Respiratory diseases
Asthma
Chronic obstructive pulmonary disease
Neurological and psychiatric disorders
Parkinson's disease
Transdermal drug delivery for Parkinson's disease
Transdermal levodopa delivery systems
Transdermal dopamine agonists for Parkinson's disease
Rotigotine for Parkinson disease
Rotigotine for restless legs syndrome
Transdermal administration of other drugs for Parkinson disease
Depression
Antidepressants
Selective serotonin-reuptake inhibitors
Transdermal fluoxetine
Monoamine oxidase inhibitors
Transdermal selegiline
Trazodone hydrochloride
Venlafaxine
Bupropion
Bipolar disorder
Transdermal lithium
Schizophrenia
Transdermal haloperidol
Transdermal risperidone for treatment of schizophrenia
Transdermal blonanserin for treatment of schizophrenia
Restless legs syndrome
Alzheimer's disease
Transdermal rivastigmine
Transdermal donepezil
Transdermal galantamine
Transdermal arecoline
Transdermal nicotine for Tourette syndrome
Attention deficit hyperactivity disorder
Transdermal methylphenidate
Migraine
Transdermal sumatriptan
Transdermal zolmitriptan
Epilepsy
Tinnitus/Vertigo
Transdermal nitroglycerin for vasospasm due to subarachnoid hemorrhage
Musculoskeletal disorders
Osteoporosis
Transdermal alendronate
Transdermal estrogen
Transdermal human parathyroid hormone
Osteoarthritis
Transdermal therapy of diabetes
Insulin delivery in diabetes by transdermal patches
Microneedle patch for glucose-responsive insulin delivery
Patch monitoring system for insulin delivery
Sonic Applicator & Control Device for TDD of insulin
V-Go® disposable insulin delivery device
ViaDor System for TDD of insulin
Companies developing devices for transdermal insulin delivery
Transdermal therapy of oral antidiabetic agents
Transdermal anti-diabetic agents other than insulin
Male disorders
Erectile dysfunction
Topical and transdermal preparation for erectile dysfunction
Hypogonadism in the male
Topical testosterone
Benign prostatic hypertrophy
Tamsulosin TDS
Women's health
Female sexual arousal disorder
Menopause
Hormone replacement therapy for menopause
Effect of transdermal estradiol on bone density
Transdermal PTH for postmenopausal osteoporosis
Transdermal testosterone for low libido in postmenopausal women
Breast disorders
Dysmenorrhea
Female infertility
Contraception
Female contraception
Ortho Evra™
AG200-15
BAY86-5016
Desogestrel
Male contraception
Transdermal progestin plus testosterone
Cancer
Delivery of the photosensitizer drug d-amino levulinic acid
Intradermal delivery of cancer vaccines by adenoviral vectors
Nanoemulsion-based delivery of caffeine for skin cancer
Topical interferon a2b for cervical cancer and precancerous lesions
Transcutaneous electroporation for delivery of anticancer drugs
Transdermal delivery of peptide cancer vaccines
Transdermal drug delivery for prostate cancer
Transdermal nitroglycerine for prostate cancer
Transdermal estradiol gel for prostate cancer
Transdermal leuprolide acetate for prostate cancer
Transdermal drug delivery for breast cancer
Afimoxifene topical gel for breast cancer
Pain
Relief of pain associated with minor medical procedures
Transdermal Lidocaine for relief of pain
Transdermal Lidoderm® for postherpetic neuralgia
Transdermal capsaicin for relief of pain
Nonsteroidal antiinflammatory drugs
Topical NSAIIDs
Transdermal ketoprofen
Topical opioids
Cancer pain
Transdermal fentanyl
Transdermal nitroglycerine as an adjuvant to opioids
Transdermal buprenorphine
Chronic pain of non-malignant origin
Transdermal local anesthetics
Postoperative pain
Transdermal fentanyl for the management of postoperative pain
Fibromyalgia
Nausea and vomiting
Motion sickness
Postoperative vomiting
Chemotherapy-induced nausea and vomiting
Antiaging strategies
Smoking cessation
Transdermal nicotine replacement
Use of nicotine patch for smoking cessation in pregnancy
Other methods of nicotine replacement
Other treatments for smoking cessation
Miscellaneous uses of transdermal drug delivery
Chronic fatigue syndrome
Overactive bladder and urinary incontinence
Transdermal oxybutynin
Viral infections
Transdermal nanoparticles for immune enhancement in HIV
Transdermal IQP-0410 for HIV/AIDS
Wound healing and ulcers
Transdermal gene therapy
Transdermal delivery of plasmid DNA by electroporation
Transdermal antisense therapy
Transdermal vaccination
The skin as an immune organ
Technologies for transdermal vaccination
Dissolvable microneedle array for vaccine delivery
Electroporation for administering DNA vaccines
Microneedles for transdermal delivery of vaccines
Needle-free delivery of vaccines
Transcutaneous immunotherapy using nanodispersions
Applications of transdermal vaccination
HIV/AIDS vaccination by topical application
Transdermal DNA influenza vaccine
Transdermal Aβ vaccination for Alzheimer's disease
Transdermal vaccination for traveller's diarrhoea
Transdermal nutraceuticals
Complications of transdermal therapy
Adverse effects of drugs
Overdose effect
Skin complications
MRI-induced skin burns from transdermal patches

4. Markets for Transdermal Drug Delivery
Introduction
Global markets for drug delivery
Geographical distribution of transdermal drug delivery markets
Emerging transdermal drug delivery markets in Asia
Transdermal technology markets in therapeutic areas
Angina pectoris
Attention deficit hyperactivity disorder
Erectile dysfunction
Hypertension
Osteoporosis
Pain therapeutics
Parkinson's disease
Smoking cessation
Transdermal hormone replacement therapy for menopause
Transdermal testosterone replacement therapy for hypogonadism in the male
Transdermal contraceptive market
Markets according to transdermal technologies
Markets for microneedle-based transdermal drug delivery
Marketing strategies for transdermal drug delivery
Marketing advantages of transdermal drug delivery
Unmet needs in transdermal drug delivery
Regulatory aspects that affect transdermal drug delivery markets
Future prospects of transdermal drug delivery
Growth of new technologies used in transdermal drug delivery
Prospects of transdermal delivery for drugs coming off patents
Transdermal delivery of biologicals
Transdermal delivery of cosmetics

5. Companies involved in transdermal drug delivery
Profiles of companies
Top companies in transdermal drug delivery
Collaborations

6. References

Tables
Table 1-1: Historical landmarks in the development of transdermal drug delivery
Table 1-2: Transdermal vs oral and intravenous drug delivery
Table 1-3: Size ranges of molecules that can be delivered by transdermal route
Table 2-1: Technologies for transdermal drug delivery
Table 2-2: Chemical enhancers of skin penetration
Table 2-3: Drug-in-adhesive versus reservoir type of transdermal patch
Table 2-4: Companies with transdermal patches for drug delivery
Table 2-5: Companies with technologies for drug delivery by iontophoresis
Table 2-6: Companies involved in electroporation-based drug delivery
Table 2-7: Companies developing microneedles for transdermal drug delivery
Table 2-8: Comparison of transdermal drug delivery systems
Table 3-1: Approved transdermal products
Table 3-2: Transdermal drugs in clinical trials or approval process
Table 3-3: Companies developing devices for transdermal insulin delivery
Table 3-4: Selected transdermal systems GLP-1 antidiabetic agents
Table 4-1: Worldwide drug delivery market growth 2016 to 2026
Table 4-2: Transdermal drug delivery markets for geographical regions 2016 to 2026
Table 4-3: Markets for transdermal products for therapeutic areas 2016-2026
Table 4-4: Markets according to transdermal technologies 2016-2026
Table 4-5: Marketing strategies based on transdermal drug delivery technologies
Table 5-1: Top ten companies in transdermal drug delivery
Table 5-2: Collaborations in transdermal drug delivery

Figures
Figure 1-1: Basic structure of the skin
Figure 1-2: Events governing transcutaneous drug absorption
Figure 2-1: Basic structure and function of transdermal drug delivery systems
Figure 2-2: Transdermal system for delivery of liquid drugs
Figure 2-3: A schematic view of electroporation
Figure 2-4: Depiction of breakdown of the stratum corneum during electroporation
Figure 2-5: A schematic drawing of iontophoresis
Figure 2-6: SonoPrep ultrasonic skin permeation
Figure 2-7: A schematic sketch of PowderJet gas gun
Figure 2-8: Drug delivery using different types of microneedles (MN)
Figure 2-9: A schematic drawing of the microneedle patch
Figure 2-10: Preparation of solid-in-oil nanodispersion for transdermal application
Figure 3-1: Oral versus transdermal administration of a drug in Parkinson’s disease
Figure 3-2: Control functions and user interface of insulin patch monitoring system
Figure 3-3: Transcutaneous immunotherapy using nanodispersions
Figure 4-1: Unmet needs in transdermal drug delivery

Order by Fax - using the form below

Order by Post - print the order form below and send to

Research and Markets,
Guinness Centre,
Taylors Lane,
Dublin 8,
Ireland.
Fax Order Form
To place an order via fax simply print this form, fill in the information below and fax the completed form to 646-607-1907 (from USA) or +353-1-481-1716 (from Rest of World). If you have any questions please visit http://www.researchandmarkets.com/contact/

Order Information
Please verify that the product information is correct and select the format(s) you require.

Product Name: Transdermal Drug Delivery - Technologies, Markets, and Companies
Web Address: http://www.researchandmarkets.com/reports/39074/
Office Code: SC

Product Formats
Please select the product formats and quantity you require:

<table>
<thead>
<tr>
<th>Product Formats</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic (PDF) - Single User</td>
<td>USD 3500</td>
</tr>
<tr>
<td>Hard Copy</td>
<td>USD 4000 + USD 57 Shipping/Handling</td>
</tr>
<tr>
<td>Electronic and Hard Copy (PDF) - Single User</td>
<td>USD 4500 + USD 57 Shipping/Handling</td>
</tr>
<tr>
<td>Electronic (PDF) - Enterprisewide</td>
<td>USD 10500</td>
</tr>
</tbody>
</table>

* Shipping/Handling is only charged once per order.
* The price quoted above is only valid for 30 days. Please submit your order within that time frame to avail of this price as all prices are subject to change.

Contact Information
Please enter all the information below in BLOCK CAPITALS

Title: Mr □ Mrs □ Dr □ Miss □ Ms □ Prof □
First Name: ___________________________ Last Name: ___________________________
Email Address: * ___________________________
Job Title: ___________________________
Organisation: ___________________________
Address: ___________________________
City: ___________________________
Postal / Zip Code: ___________________________
Country: ___________________________
Phone Number: ___________________________
Fax Number: ___________________________

* Please refrain from using free email accounts when ordering (e.g. Yahoo, Hotmail, AOL)
Payment Information

Please indicate the payment method you would like to use by selecting the appropriate box.

☐ Pay by credit card: You will receive an email with a link to a secure webpage to enter your credit card details.

☐ Pay by check: Please post the check, accompanied by this form, to:
Research and Markets,
Guinness Center,
Taylors Lane,
Dublin 8,
Ireland.

☐ Pay by wire transfer: Please transfer funds to:

<table>
<thead>
<tr>
<th>Account number</th>
<th>833 130 83</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sort code</td>
<td>98-53-30</td>
</tr>
<tr>
<td>Swift code</td>
<td>ULSBIE2D</td>
</tr>
<tr>
<td>IBAN number</td>
<td>IE78ULSB9853308313083</td>
</tr>
<tr>
<td>Bank Address</td>
<td>Ulster Bank, 27-35 Main Street, Blackrock, Co. Dublin, Ireland.</td>
</tr>
</tbody>
</table>

If you have a Marketing Code please enter it below:

Marketing Code: ____________________________

Please note that by ordering from Research and Markets you are agreeing to our Terms and Conditions at http://www.researchandmarkets.com/info/terms.asp

Please fax this form to:

(646) 607-1907 or (646) 964-6609 - From USA
+353-1-481-1716 or +353-1-653-1571 - From Rest of World