How Can Pharma Benefit from a Well-Defined and Robust Delivery Device Platform?

PDA Europe

Workshop Drug Delivery Systems

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SHL Group

SHL Group Overview

- World-leading designer, developer and manufacturer of advanced drug delivery systems
- 3,700+ employees worldwide
- R&D in Sweden, USA & Taiwan
- Production in Taiwan
- Final assembly in USA
- 30 combination products launched globally by 2018
- Excellent global supply record for all products
- Multiple platform technologies available for immediate customization

The SHL Range of Drug Delivery Platform Devices

Working with leading biotechnology and pharmaceutical companies, SHL develops advanced drug delivery devices, including disposable and reusable injectors with fixed or variable dosing, high dose accuracy and the ability to accommodate high volumes and high viscosities.

DAI®

MOLLY®

AMBER®

SDI MIX® + NIT™

MADIE®

PPI®

How Can Pharma Benefit from a Well-Defined and Robust Delivery Device Platform?

OUTLINE

1. Historical trends in parenteral drug packaging
2. Overview of the global injection market
3. Device development program: core elements and timelines
4. Benefits of a platform technology
5. Conclusion

1. HISTORICAL TRENDS

Historical Trends in Parenteral Drug Packaging

- Ampoules
- Vials
- Disposable syringes
- Infusions

1970s

- Prefilled Syringes
  - Vaccines
  - Anticoagulants

1980s

- Pen Injectors
  (Reusable & Disposable)
  - Insulin
  - Growth hormones
  - Osteoporosis
  - GLP1
  - Interferons

1990s

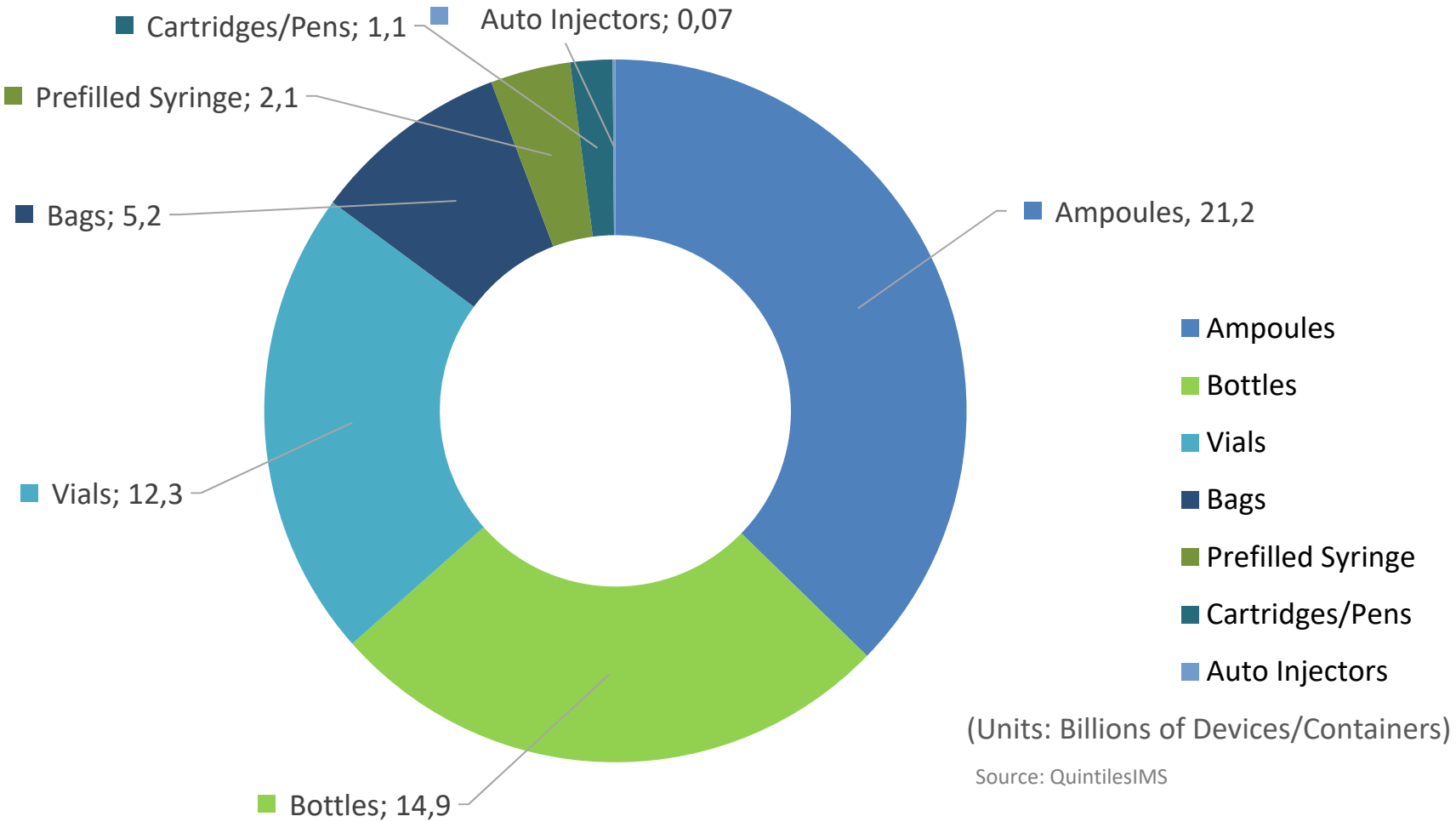
- Auto Injectors
  - Biologics
  - Generics
  - Biosimilars

2000s

Ongoing developments in syringes (safety), needles, prefilled syringes, pens, auto injectors, pumps and infusers

2. GLOBAL INJECTION MARKET OVERVIEW

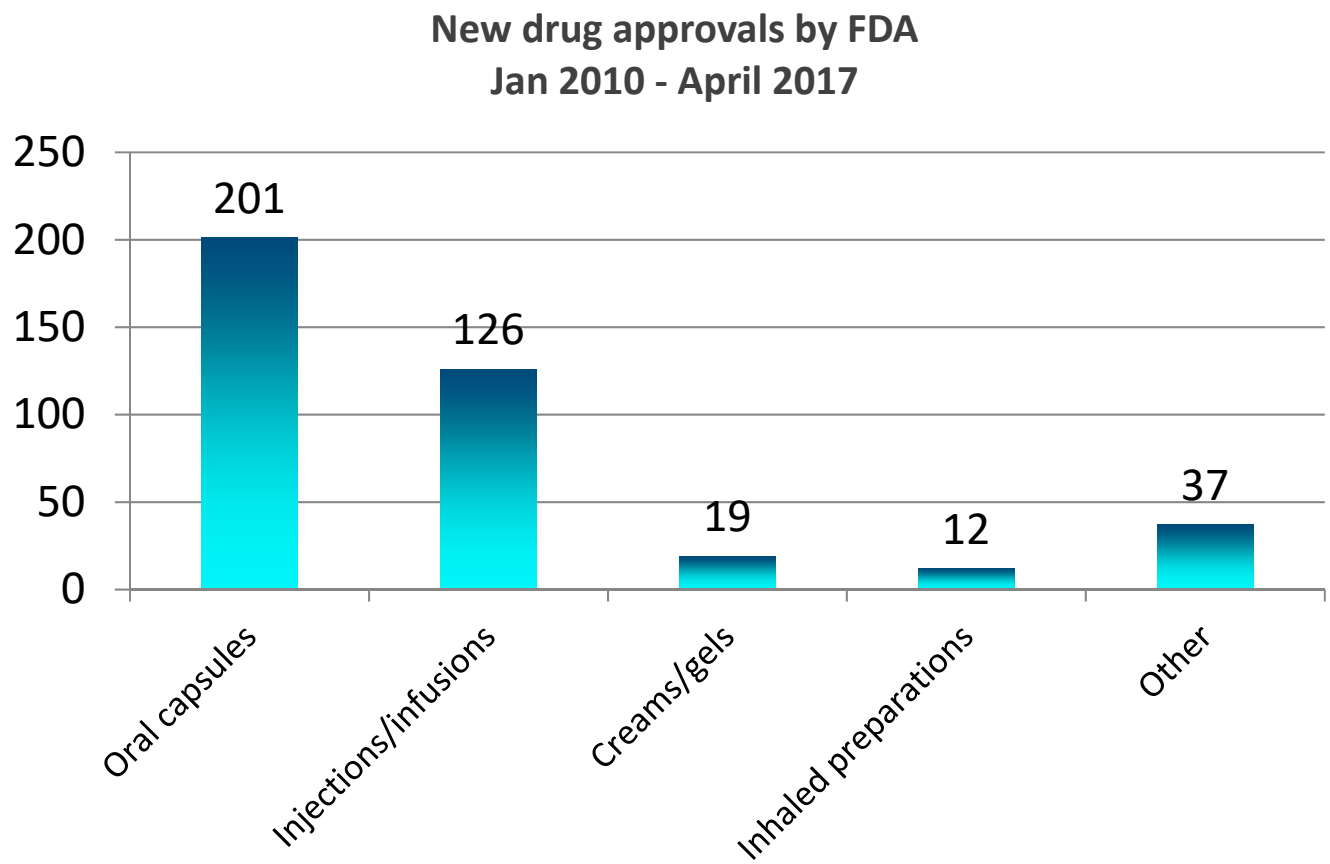
Overview of the Global Injectables Market by Container Type



(Units: Billions of Devices/Containers)

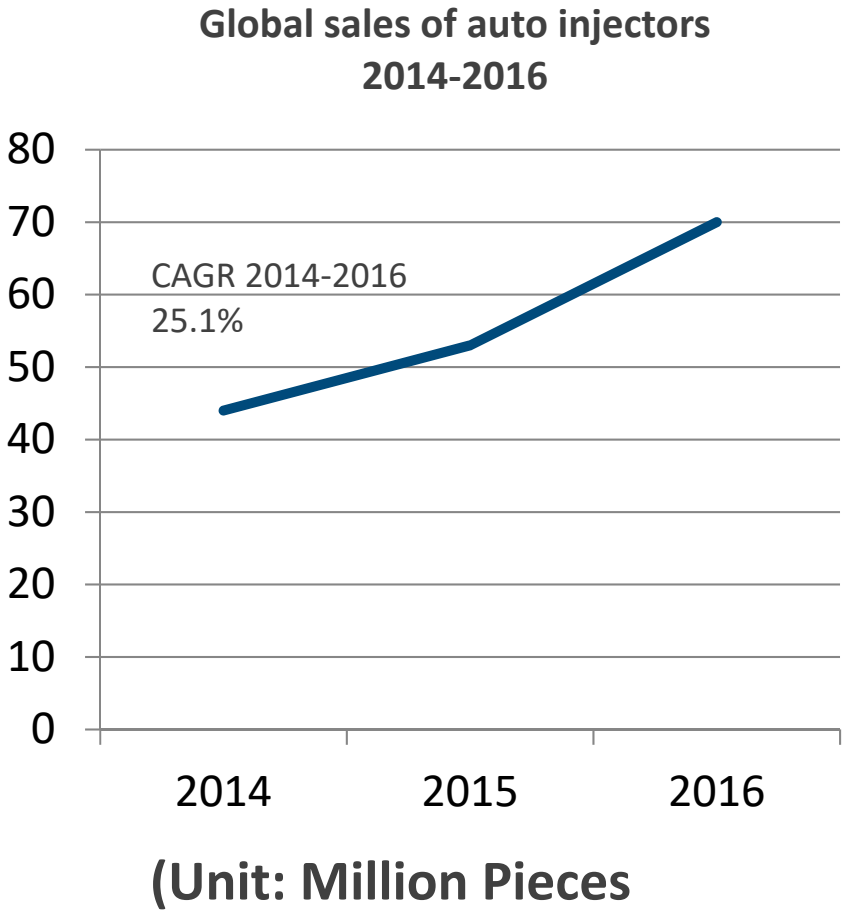
Source: QuintilesIMS

Growth in the Number of Drugs Approved for Self-Injection



Source: www.centerwatch.com & www.accessdata.fda.gov

Growth in the Number of Drugs Approved for Self-Injection



Source: Quintiles IMS

Of 28 first-time approvals for subcutaneous home injection:

- 6 are in ampoules/vials only
- 22 are with an advanced drug delivery system

Why Is the Market in Favor of Self-Injection Devices?

Increase in Chronic Diseases

- Home treatment – improves convenience
- Self injection – enhanced safety reduces risk of error (e.g., permanently hidden needle)
- Patient-centric devices – intuitive and easy to use
- Added features – reminders, apps, connectivity and others

Emergence of Biologics

- Injectables – unit dose
- Expensive treatments – premium products
- Subcutaneous injection – offers right injection depth and technique
- Infrequent injection – minimal training, easy to use

Spiraling Healthcare Costs

- Avoid errors and waste – no drug transfer
- Reduced drug overfill - minimizes dead volume
- Pay for performance – help achieve compliance and adherence
- Reduced costs – avoid hospital and avoid HCP calling on patient

3. THE DEVICE DEVELOPMENT PROGRAM

9 Core Elements of a Device Program

Regulatory strategy need to be defined early on

Device Development Programs Take Time

Initiation → **Development Time** → **Launch**

Development programs have multiple stages/phases:

- Design definition, URS
- Design & development
- Engineering
- HF studies (formative, summative)
- Stability
- Validation/verification
- Filing
- Commercialization

Changing regulatory expectations increases the workload/time to market

Realities of the Biopharma Industry

- Works with short timelines
- Faces resource reduction
- Has to manage on a budget
- Needs to minimize risk
- Has to consider the complete supply chain
- Needs to follow proven regulatory paths, avoiding the unknown
- Finding proven track record of device design & manufacturing is essential
- Does not want to risk the sales of the drug with something new and unproven
- Has to cover robustness of product and manufacturing processes

Device project manager
at a pharmaceutical company

Utilizing a Platform Technology to Address Industry Needs

Preconfigured device program
Robust and simplified mechanisms
Non-customized design

Bespoke industrial design
Proven robust mechanism

Platforms can address the core elements of device development

Source: Chugai Pharmaceutical

Speed Up Time to Market with Molly

A compact, easy-to-use auto injector with needle cover activation

- First “preconfigured” product
- Disposable, single-dose auto injector
- Simplified 2-step operation
- Ultra-compact design
- Supports FNS/RNS syringes with volumes from 1.0mL long to 2.25mL
- Automatic needle shielding
- Additional features upon request:
  - End-of-dose signal, feedback signal
  - Connectivity features
  - Tamper evidence

4. BENEFITS OF A PLATFORM TECHNOLOGY

A Preconfigured Business Model Is More Cost-Effective

Customers might not need to invest in:

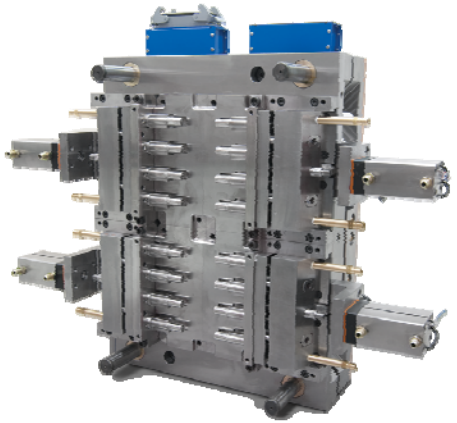
- Tool sets
- Assembly equipment for sub-assemblies
- Testing equipment
- Final assembly equipment (e.g., utilizing SHL Pharma's final assembly services)

Designed for large-scale production
Fast clinical sample availability

Shorter timelines, faster time to markets, lower project cost

A Customized Platform Is a Long-Term Investment

- Customer investment is be required
- A robust, universal platform can be established based on:
  - Known patent position
  - Proven technology
- Company branding can be created
- Differentiation from competition for originator products
- Design for large scale manufacturing
- Allows for easier scalability
- Development time is shorter for follow-up projects

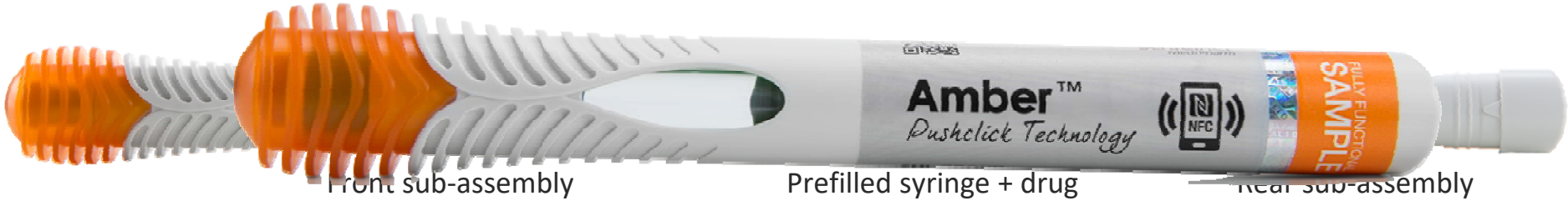


Long-term savings on investments and development time

Source: Novartis

TS2
MOU3

Container Adaptation: a Big Challenge to Be Mastered



Front sub-assembly | Prefilled syringe + drug | Rear sub-assembly

Prefilled auto injector

The first step in any drug delivery program: define your container

Folie 21

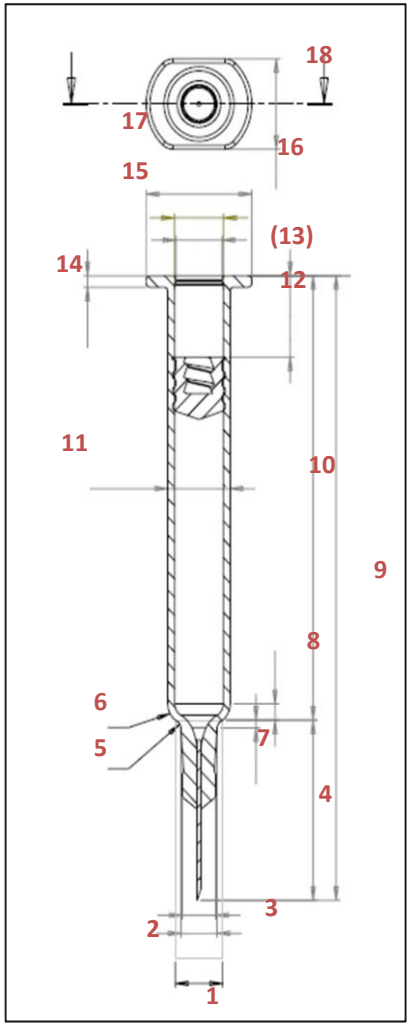
TS2 Elements should appear on click coming from me and not fly in automatically, please change
Thomas Schönknecht; 03.11.2017

MOU3 Done
Jackie Su; 03.11.2017

Container Adaptation: a Big Challenge to Be Mastered

Syringe specifications:

- Out of these 18 dimensions, 9 are normally without specifications
- Performance and physical strength are other weak areas
- The good news is new glass syringes with more specifications have recently been launched!



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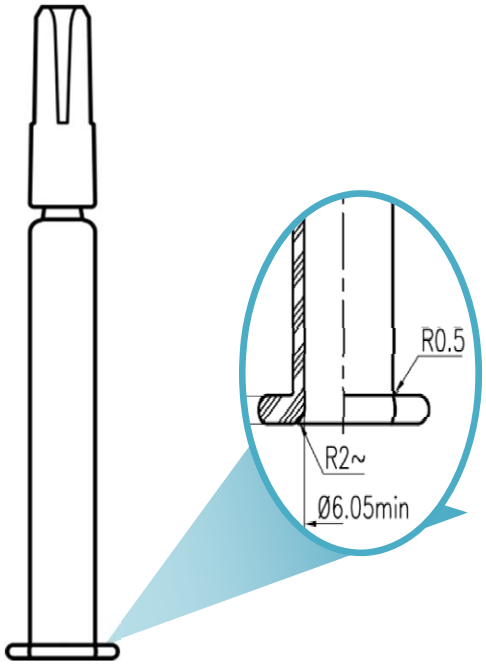
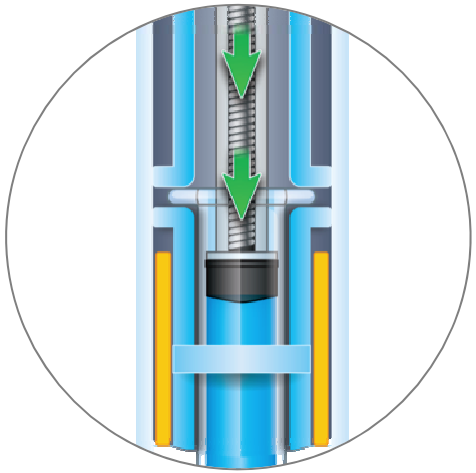
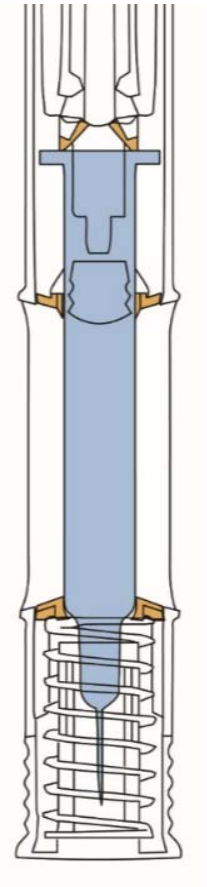




Flange stability can be critical to the functionality of the system and is sometimes submitted to high mechanical stress



Finger flange
back end shape

Cylindrical body
outer diameter

Shoulder area
outer shape

Flange stability and geometry are a function of size & forming control

TS3
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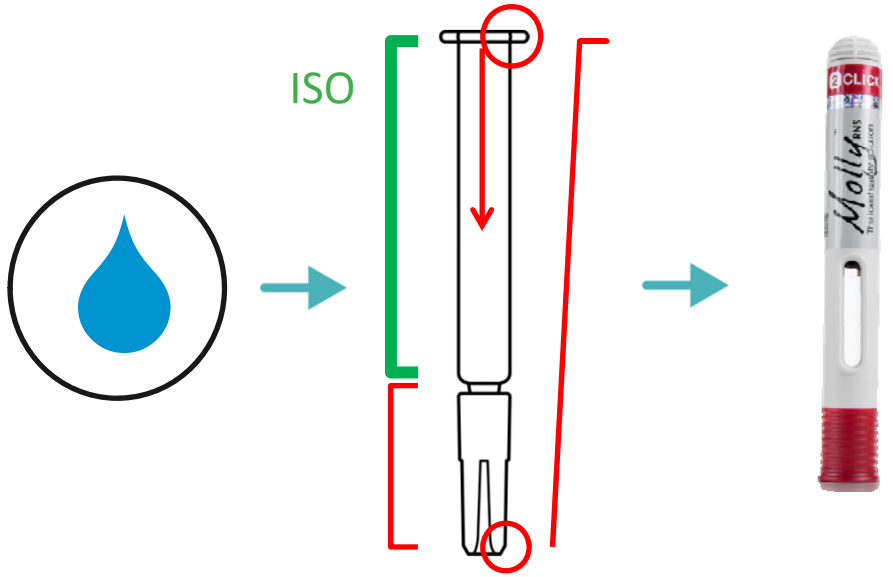
ISO 11040: Setting the Path for Prefilled Syringes



Manual Injection
Easy to manage
Fewer parameters to check

Auto Injection
More parameters to manage
More experience required

Prefilled Syringe User Requirements for Biotechnology Applications

Technical Report No. 73

ISBN: 978-0-939459-82-7

Summarizes the need for auto injectors

Folie 24

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Thomas Schönknecht; 03.11.2017

MOU4 Done
Jackie Su; 03.11.2017

Improvements in Prefilled Syringes

- Check for process capability data
- New biotech PFS are being offered from a number of suppliers
- Tighter dimensional and process controls (siliconization) support the needs of device manufacturers
- Plastic/polymer PFS solutions address common glass issues

Define/qualify your platform container (1.0mL long; 2.25mL)

Define Your Customized Industrial Design Early On

- Human factors studies are mandatory for regulatory submissions
- Devices should be introduced at early stages
  - Define your design features
  - Analyze your target patient group needs
  - Try to establish a multi-use compatible design
  - Create a company branding
- Confirm usability early in formative studies

Win time based on existing "platform device designs"

Gain from an Already Proven Design Concept

Medical Devices: Evidence and Research

Dovepress
open access to scientific and medical research

Open Access Full Text Article

ORIGINAL RESEARCH

Human factors validation study of 3 mg sumatriptan autoinjector, for migraine patients

This article was published in the following Dove Press journal:
Medical Devices: Evidence and Research
30 May 2016
Number of times this article has been viewed

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Background: Migraine pain relief is reported by more than 50% of patients who receive low dose (3 mg) of sumatriptan. Currently, there is no two-step autoinjector of low-dose sumatriptan available on the market for acute migraine treatment. To fulfill this need, a fully assembled, single-dose, subcutaneous autoinjector (sumatriptan 3 mg; product-code DFN-11) was developed. The device allows for injection with a simple two-step, push-to-inject process and provides feedback of the injection activation, progress, and completion.

Objective: To determine if DFN-11 autoinjector can be used correctly and safely by migraine patients.

Methods and participants: A human factors validation study was conducted with 45 migraine patients (30 oral-only medications users; 15 injectable sumatriptan users) who performed one unaided simulated injection. Two days prior, half the oral participants were briefly trained. All others were only given the device to inspect and written instructions to review. No injections were performed during the initial session. All participants received written instructions at the injection session.

Results: All participants (45/45; 100%) performed the injection without any errors. Objective measures included device removal from packaging, cap removal, expiration date check, inspection of fluid in window, identification of allowable injection site, proper device positioning, dose confirmation, and device disposal. All participants (45/45; 100%) reported no

Source: Dove Press

Molly, a globally launched device supported by human factors studies

Examples of Non-Customized Platform Devices

Zembrace SYMTOUCH (sumatriptan injection)

Benepali Etanercept

NORDiMET methotrexate

Successful preconfigured platform drug delivery offerings

Source: Promius Pharma/Biogen/Nordic Pharma

Platforms Can Help Simplify the Regulatory Process

- Global regulations, standards and guidance documents are embedded into device platform technologies:
  - ISO11608 requirements
  - FDA/EMEA Guidance
- Utilize your device development partners' experience to increase robustness of filing documentation

5. CONCLUSION

Platform Technology Leverages Established Technology

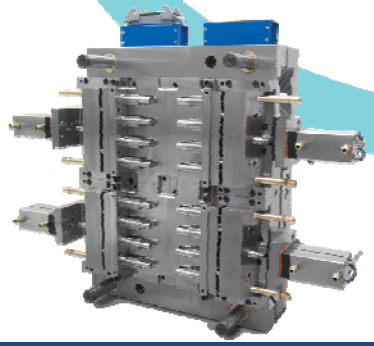
Filling

Release

Final assembly

Control your costs by optimizing your investments

Engineering/molding



Assembly

Shorten time line by using proven patented technology

Advantages Of Using a Platform Technology

Accelerated development timelines:

- Known technology and patent landscape
- Design & development and engineering
- Fast access to formative study data
- Shorter timeframe to clinical & summative studies
- Shorter time to market

Cost optimization:

- Reduced investment using preconfigured platform
- Clear investment planning in case of company-specific platform
- Scalability

Clear regulatory path:

- Utilizing established knowledge internally and at agencies

Creating company branding

Source: Roche

Leveraging platform benefits requires an experienced development partner

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