

**CENTER FOR DRUG EVALUATION AND  
RESEARCH**

***APPLICATION NUMBER:***

**206073Orig1s000**

**SUMMARY REVIEW**

NDA-206073

Sponsor: Boehringer Ingelheim

SD-1, eCTD-0000

Received: January 29, 2014

Primary Safety Review/CDTL

Reviewer: William H. Chong

---

## CLINICAL REVIEW/CROSS-DISCIPLINE TEAM LEADER REVIEW

Application NDA-206073

Supporting Document Number SD-1

Submission Receipt Date January 29, 2014

PDUFA Goal Date January 30, 2015

Division Division of Metabolism and Endocrinology  
Products

Reviewer William H. Chong

Review Completion Date January 29, 2015

Generic name Empagliflozin/Linagliptin

Trade name GLYXAMBI

Therapeutic class Fixed dose combination of a sodium dependent glucose cotransporter-2 inhibitor and a dipeptidyl peptidase-4 inhibitor

Applicant Boehringer Ingelheim

Priority designation Standard

Formulation Tablet

Dosing regimen Empagliflozin 10 mg/Linagliptin 5 mg

Empagliflozin 25 mg/Linagliptin 5 mg

Indication Type 2 diabetes mellitus

Intended population Adults with type 2 diabetes mellitus

Related INDs/NDAs IND-108388 (Empagliflozin/Linagliptin);  
NDA-201280 (Linagliptin); NDA-204629  
(Empagliflozin)

Division Director Jean-Marc Guettier

Statistical Reviewer Jennifer Clark

Clinical Pharmacology Reviewer Suryanarayana Sista

Pharmacology/Toxicology Reviewer David Carlson

Chemistry, Manufacturing and Controls Joseph Leginus and Karen Riviere

Project Manager Callie Cappel-Lynch

## Table of Contents

Table of Contents .....	2
Table of Tables .....	6
Table of Figures .....	10
Abbreviations:.....	11
1. Recommendations/Risk-Benefit Assessment .....	13
1.1 Recommendation on Regulatory Action .....	13
1.2 Risk-Benefit Assessment.....	13
1.3 Recommendations for Post market Risk Evaluation and Mitigation Strategies .....	17
1.4 Recommendations for Post market Requirements and Commitments.....	17
2. Introduction and Regulatory Background .....	17
2.1 Product information.....	17
2.2 Currently Available Treatments for the Proposed Indication .....	17
2.3 Availability of Proposed Active Ingredient in the United States .....	18
2.4 Important Issues with Consideration to Related Drugs.....	18
2.5 Summary of Presubmission Regulatory Activity Related to Submission.....	18
3. Ethics and Good Clinical Practices .....	19
3.1 Submission Quality and Integrity.....	19
3.2 Compliance with Good Clinical Practice .....	19
3.3 Financial Disclosures .....	19
4. Significant Efficacy/Safety Issues Related to Other Review Disciplines .....	19
4.1 Chemistry, Manufacturing and Controls.....	19
4.2 Clinical Microbiology .....	21
4.3 Preclinical Pharmacology/Toxicology .....	21
4.4 Clinical Pharmacology .....	23
4.4.1 Mechanisms of Action .....	23
4.4.2 Pharmacodynamics .....	23
4.4.3 Pharmacokinetics .....	23
5. Sources of Clinical Data .....	24
5.1 Tables of Studies/Clinical Trials .....	25
5.2 Review Strategy .....	25
5.3 Discussion of Individual Studies/Clinical Trials.....	26
6. Review of Efficacy .....	26
6.1 Efficacy Summary.....	26

6.2 Indication.....	28
6.2.1 Methods.....	28
6.2.2 Demographics .....	28
6.2.3 Patient Disposition .....	29
6.2.4 Analysis of Primary Endpoint(s) .....	33
6.2.5.1 Fasting plasma glucose.....	35
6.2.5.2 Body weight.....	37
6.2.5.3 Ability to achieve target HbA1c .....	39
6.2.6 Other Endpoint(s).....	41
6.2.6.1 Changes in blood pressure.....	41
6.2.6.2 Need for rescue medication .....	47
6.2.7 Subpopulations.....	49
6.2.7.1 By baseline HbA1c.....	49
6.2.7.2 By Age.....	54
6.2.7.3 By estimated glomerular filtration rate.....	57
6.2.7.4 By region .....	60
6.2.8 Analysis of Clinical Information Relevant to Dosing Recommendations .....	63
6.2.9 Discussion of Persistence of Efficacy and/or Tolerance Effects .....	63
6.2.10 Additional Efficacy Analyses .....	65
6.2.11 Discussion of Efficacy Issue(s).....	66
7. Review of Safety .....	67
7.1 Safety Summary .....	67
7.2 Methods.....	68
7.2.1 Studies/Clinical Trials Used to Evaluate Safety .....	68
7.2.2 Categorization of Adverse Events .....	68
7.2.2.1 Criteria for Withdrawal/Early Discontinuation .....	69
7.2.3 Pooling of Data Across Clinical Trials to Estimate and Compare Incidence .....	70
7.3 Adequacy of Safety Assessments.....	70
7.3.1 Overall Exposure at Appropriate Doses/Durations and Demographics of Target Populations .....	70
7.3.2 Explorations for Dose Response.....	74
7.3.3 Special Animal and/or <i>In Vitro</i> Testing .....	74
7.3.4 Routine Clinical Testing .....	74
7.3.5 Metabolic, Clearance, and Interaction Workup .....	74
7.3.6 Evaluation for Potential Adverse Events for Similar Drugs in Drug Class .....	74

7.4 Major Safety Results .....	75
7.4.1 Deaths .....	75
7.4.1.1 Narratives of Deaths .....	76
7.4.2 Nonfatal Serious Adverse Events .....	79
7.4.2.1 Narratives of Non-fatal Serious Adverse Events.....	80
7.4.3 Dropouts and/or Discontinuations .....	83
7.4.3.1 Narratives of Discontinuations due to Adverse Events .....	85
7.4.4 Significant Adverse Events.....	85
7.4.5 Submission Specific Safety Concerns .....	88
7.4.5.1 Volume depletion .....	88
7.4.5.2 Changes in renal function .....	100
7.4.5.3 Hepatic events.....	102
7.4.5.4 Urinary tract infections .....	91
7.4.5.5 Genital infections.....	94
7.4.5.6 Malignancies.....	100
7.4.5.7 Hypoglycemia.....	88
7.4.5.8 Pancreatitis.....	107
7.4.5.9 Hypersensitivity reactions .....	107
7.4.5.10 Skin lesions.....	108
7.4.5.11 Cardiovascular Safety.....	110
7.5 Supportive Safety Results .....	112
7.5.1 Common Adverse Events .....	112
7.5.2 Laboratory Findings.....	124
7.5.2.1 Electrolytes .....	124
7.5.2.2 Lipase.....	125
7.5.2.3 Hematocrit .....	128
7.5.2.4 Lipids .....	131
7.5.3 Vital Signs.....	135
7.5.4 Electrocardiograms .....	136
7.5.5 Special Safety Studies/Clinical Trials.....	136
7.5.6 Immunogenicity .....	136
7.6 Other Safety Explorations .....	136
7.6.1 Dose Dependency for Adverse Events .....	136
7.6.2 Time Dependency for Adverse Events .....	136
7.6.3 Drug-Demographic Interactions .....	136
7.6.4 Drug-Disease Interactions.....	137

# Explore Litigation Insights



Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

## Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

## Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

## Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

### API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

### LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

### FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

### E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.