



## Clinical trial results:

## Effect of SGLT2 inhibition on coronary microvascular function in type 2 diabetes

### Summary

EudraCT number	2017-000240-17
Trial protocol	DK
Global end of trial date	18 December 2018

### Results information

Result version number	v1 (current)
This version publication date	18 December 2020
First version publication date	18 December 2020

### Trial information

#### Trial identification

Sponsor protocol code	ESTIMATE
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#### Additional study identifiers

ISRCTN number	-
ClinicalTrials.gov id (NCT number)	-
WHO universal trial number (UTN)	-

Notes:

### Sponsors

Sponsor organisation name	Bispebjerg University Hospital
Sponsor organisation address	Bispebjerg Bakke 23, København NV, Denmark, 2400
Public contact	Eva Prescott, Bispebjerg University Hospital, 27201195 27201195, hannah.elena.suhrs@regionh.dk
Scientific contact	Eva Prescott, Bispebjerg University Hospital, 27201195 27201195, hannah.elena.suhrs@regionh.dk

Notes:

### Paediatric regulatory details

Is trial part of an agreed paediatric investigation plan (PIP)	No
Does article 45 of REGULATION (EC) No 1901/2006 apply to this trial?	No
Does article 46 of REGULATION (EC) No 1901/2006 apply to this trial?	No

Notes:

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**Results analysis stage**

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Analysis stage	Final
Date of interim/final analysis	30 November 2020
Is this the analysis of the primary completion data?	Yes
Primary completion date	18 December 2018
Global end of trial reached?	Yes
Global end of trial date	18 December 2018
Was the trial ended prematurely?	No

Notes:

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**General information about the trial**

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Main objective of the trial:

to evaluate the effect of treatment with SGLT2 inhibitors on the coronary microvasculature in patients with type 2 diabetes mellitus

Protection of trial subjects:

none

Background therapy: -

Evidence for comparator: -

Actual start date of recruitment	03 April 2017
Long term follow-up planned	No
Independent data monitoring committee (IDMC) involvement?	Yes

Notes:

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**Population of trial subjects**

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**Subjects enrolled per country**

Country: Number of subjects enrolled	Denmark: 26
Worldwide total number of subjects	26
EEA total number of subjects	26

Notes:

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**Subjects enrolled per age group**

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In utero	0
Preterm newborn - gestational age < 37 wk	0
Newborns (0-27 days)	0
Infants and toddlers (28 days-23 months)	0
Children (2-11 years)	0
Adolescents (12-17 years)	0
Adults (18-64 years)	12
From 65 to 84 years	14
85 years and over	0

## Subject disposition

### Recruitment

Recruitment details:

We included 26 participants between 21-06-2017 and 15-06-2018. Patient were followed for diabetes at the outpatient clinic at Bispebjerg University Hospital, Copenhagen, Denmark.

### Pre-assignment

Screening details:

We screened hospital records of 1196 patients. A letter of invitation was sent to 322 patients who passed the initial pre-screening and 47 passed the second pre-screening after contact was established by phone.

### Period 1

Period 1 title	Intervention (overall) (overall period)
Is this the baseline period?	Yes
Allocation method	Randomised - controlled
Blinding used	Double blind
Roles blinded	Subject, Investigator

### Arms

Are arms mutually exclusive?	No
<b>Arm title</b>	Empagliflozine

Arm description:

12 weeks treatment with empagliflozine

Arm type	Experimental
Investigational medicinal product name	empagliflozine
Investigational medicinal product code	
Other name	
Pharmaceutical forms	Capsule, hard
Routes of administration	Oral use

Dosage and administration details:

25 mg empagliflozine daily for 12 weeks

<b>Arm title</b>	Placebo
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Arm description:

12 weeks treatment with placebo

Arm type	Placebo
Investigational medicinal product name	glucosemonohydrate
Investigational medicinal product code	
Other name	
Pharmaceutical forms	Capsule, hard
Routes of administration	Oral use

Dosage and administration details:

1 tablet daily for 12 weeks

<b>Number of subjects in period 1</b>	Empagliflozine	Placebo
Started	26	26
Completed	19	19
Not completed	7	7
Physician decision	2	2
reason unrelated to study	5	5

## Baseline characteristics

### Reporting groups

Reporting group title	Intervention (overall)
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Reporting group description:

As the study was designed as a cross-over study, the same subjects participated in period 1 and period 2, receiving either active treatment or placebo.

Reporting group values	Intervention (overall)	Total	
Number of subjects	26	26	
Age categorical Units: Subjects			
In utero		0	
Preterm newborn infants (gestational age < 37 wks)		0	
Newborns (0-27 days)		0	
Infants and toddlers (28 days-23 months)		0	
Children (2-11 years)		0	
Adolescents (12-17 years)		0	
Adults (18-64 years)		0	
From 65-84 years		0	
85 years and over		0	
Age continuous Units: years			
arithmetic mean	60.5		
full range (min-max)	42 to 73	-	
Gender categorical Units: Subjects			
Female	9	9	
Male	17	17	
coronary flow velocity reserve Units: ratio			
arithmetic mean	2.60		
standard deviation	± 0.56	-	

## End points

### End points reporting groups

Reporting group title	Empagliflozine
Reporting group description: 12 weeks treatment with empagliflozine	
Reporting group title	Placebo
Reporting group description: 12 weeks treatment with placebo	

### Primary: change in coronary flow velocity reserve

End point title	change in coronary flow velocity reserve
End point description: Coronary flow velocity reserve is the ratio of the coronary flow velocity at hyperemia to rest. Change in coronary flow velocity reserve was the primary endpoint.	
End point type	Primary
End point timeframe: Coronary flow velocity reserve was measured before and after 12 weeks treatment with empagliflozine and before and after 12 weeks treatment with placebo. Change in coronary flow velocity reserve was the primary endpoint.	

End point values	Empagliflozine	Placebo		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	19	19		
Units: ratio				
arithmetic mean (standard deviation)	-0.16 ( $\pm$ 0.58)	0.18 ( $\pm$ 0.60)		

### Statistical analyses

Statistical analysis title	two-sample t-test
Statistical analysis description: Data was analyzed as two-sample t-test comparing changes within and between the empagliflozin treatment group and the placebo group after ensuring there was no carry over, sequence or period effect. Carry over effects were measured using the pkcross command in Stata 13.1 for cross-over design studies. Paired two-sample t-test was used for within allocation comparisons whereas unpaired two-sample t-test was used for between treatment allocation comparisons.	
Comparison groups	Empagliflozine v Placebo
Number of subjects included in analysis	38
Analysis specification	Pre-specified
Analysis type	superiority
P-value	$\leq$ 0.05
Method	t-test, 2-sided



## Adverse events

### Adverse events information

Timeframe for reporting adverse events:

Adverse events were reported at a scheduled clinical visit 1-3 weeks after initiating treatment and thereafter at a scheduled phone call approximately 14 days later. When needed extra phonecalls were planned.

Adverse event reporting additional description:

Adverse event were registered by regular clinical visits and phone calls. Participants had a direct number to study staff on working days.

Assessment type	Systematic
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### Dictionary used

Dictionary name	MedDRA
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Dictionary version	10.0
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### Reporting groups

Reporting group title	Empagliflozine
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Reporting group description:

12 weeks treatment with empagliflozine

Reporting group title	Placebo
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Reporting group description:

12 weeks treatment with placebo

Serious adverse events	Empagliflozine	Placebo	
Total subjects affected by serious adverse events			
subjects affected / exposed	0 / 26 (0.00%)	0 / 26 (0.00%)	
number of deaths (all causes)	0	0	
number of deaths resulting from adverse events	0	0	

Frequency threshold for reporting non-serious adverse events: 1 %

Non-serious adverse events	Empagliflozine	Placebo	
Total subjects affected by non-serious adverse events			
subjects affected / exposed	8 / 26 (30.77%)	5 / 26 (19.23%)	
Neoplasms benign, malignant and unspecified (incl cysts and polyps)			
Paget's disease of nipple			
subjects affected / exposed	0 / 26 (0.00%)	1 / 26 (3.85%)	
occurrences (all)	0	1	
Cardiac disorders			
Palpitations			

subjects affected / exposed occurrences (all)	0 / 26 (0.00%) 0	1 / 26 (3.85%) 1	
General disorders and administration site conditions Dizziness subjects affected / exposed occurrences (all)	1 / 26 (3.85%) 1	0 / 26 (0.00%) 0	
Gastrointestinal disorders Constipation subjects affected / exposed occurrences (all)	1 / 26 (3.85%) 1	0 / 26 (0.00%) 0	
Renal and urinary disorders drop in renal function subjects affected / exposed occurrences (all)	1 / 26 (3.85%) 1	0 / 26 (0.00%) 0	
Endocrine disorders Hypoglycaemia subjects affected / exposed occurrences (all)	2 / 26 (7.69%) 2	1 / 26 (3.85%) 1	
Musculoskeletal and connective tissue disorders Muscle discomfort subjects affected / exposed occurrences (all)	2 / 26 (7.69%) 2	0 / 26 (0.00%) 0	
Infections and infestations Skin infection subjects affected / exposed occurrences (all)	4 / 26 (15.38%) 5	2 / 26 (7.69%) 2	

## More information

### Substantial protocol amendments (globally)

Were there any global substantial amendments to the protocol? No

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### Interruptions (globally)

Were there any global interruptions to the trial? No

### Limitations and caveats

None reported