



Clinical trial results:

Low-dose glucagon for Prevention of Exercise-Induced Hypoglycemia in People with Type 1 Diabetes

Summary

| | |
|--------------------------|----------------|
| EudraCT number | 2021-001342-34 |
| Trial protocol | DK |
| Global end of trial date | 31 August 2023 |

Results information

| | |
|--------------------------------|------------------|
| Result version number | v1 (current) |
| This version publication date | 27 November 2024 |
| First version publication date | 27 November 2024 |

Trial information

Trial identification

| | |
|-----------------------|-------|
| Sponsor protocol code | 78618 |
|-----------------------|-------|

Additional study identifiers

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

Notes:

Sponsors

| | |
|------------------------------|---|
| Sponsor organisation name | Steno Diabetes Center Copenhagen |
| Sponsor organisation address | Borgmester Ib Juuls Vej 89, Herlev, Denmark, 2730 |
| Public contact | Sissel Lundemose, Steno Diabetes Center Copenhagen, +45 23742764, sissel.lundemose@regionh.dk |
| Scientific contact | Sissel Lundemose, Steno Diabetes Center Copenhagen, +45 23742764, sissel.lundemose@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:

Results analysis stage

| | |
|--|----------------|
| Analysis stage | Final |
| Date of interim/final analysis | 31 August 2023 |
| Is this the analysis of the primary completion data? | Yes |
| Primary completion date | 31 August 2023 |
| Global end of trial reached? | Yes |
| Global end of trial date | 31 August 2023 |
| Was the trial ended prematurely? | No |

Notes:

General information about the trial

Main objective of the trial:

The primary objective of the study is to compare the efficacy of single-administration low-dose (150 µg) s.c. glucagon and split-administration low-dose (2 x 75 µg) s.c. glucagon to placebo for prevention of exercise-induced hypoglycemia in people with type 1 diabetes using insulin pumps and multiple daily injections (MDI).

Protection of trial subjects:

NA

Background therapy:

All participants used their regular treatment modality; 11 participants used insulin pump therapy and 11 participants used MDI therapy.

Evidence for comparator:

-

| | |
|---|----------------|
| Actual start date of recruitment | 02 August 2021 |
| Long term follow-up planned | No |
| Independent data monitoring committee (IDMC) involvement? | No |

Notes:

Population of trial subjects

Subjects enrolled per country

| | |
|--------------------------------------|-------------|
| Country: Number of subjects enrolled | Denmark: 22 |
| Worldwide total number of subjects | 22 |
| EEA total number of subjects | 22 |

Notes:

Subjects enrolled per age group

| | |
|---|----|
| 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) | 17 |

| | |
|---------------------|---|
| From 65 to 84 years | 5 |
| 85 years and over | 0 |

Subject disposition

Recruitment

Recruitment details:

Participants were recruited from the outpatient diabetes clinic at Steno Diabetes Center Copenhagen from November 2021 to June 2023.

Pre-assignment

Screening details:

After providing oral and written informed consent, participants completed a screening visit for assessment of the eligibility criteria. Procedures included routine blood sampling, physical examination, review of medical history and medications as well as registration of baseline characteristics.

Period 1

| | |
|------------------------------|---------------------------------------|
| Period 1 title | Study period overall (overall period) |
| Is this the baseline period? | Yes |
| Allocation method | Randomised - controlled |
| Blinding used | Single blind |
| Roles blinded | Subject |

Blinding implementation details:

The study was a single-blind study. The participants were blinded to the intervention.

Arms

| | |
|------------------------------|------------------------|
| Are arms mutually exclusive? | No |
| Arm title | 150 microgram glucagon |

Arm description:

Pre-exercise 150 µg s.c. glucagon and post-exercise placebo

| | |
|--|---|
| Arm type | Experimental |
| Investigational medicinal product name | GlucaGen |
| Investigational medicinal product code | SUB02347MIG |
| Other name | |
| Pharmaceutical forms | Concentrate and solvent for solution for injection/infusion |
| Routes of administration | Injection |

Dosage and administration details:

150 microgram and s.c. injection

| | |
|------------------|-----------------------|
| Arm title | 75 microgram glucagon |
|------------------|-----------------------|

Arm description:

Pre-exercise 75 µg s.c. glucagon and post-exercise 75 µg s.c. glucagon

| | |
|--|---|
| Arm type | Experimental |
| Investigational medicinal product name | GlucaGen |
| Investigational medicinal product code | SUB02347MIG |
| Other name | |
| Pharmaceutical forms | Concentrate and solvent for solution for injection/infusion |
| Routes of administration | Injection |

Dosage and administration details:

150 microgram and s.c. injection

| | |
|------------------|---------|
| Arm title | Placebo |
|------------------|---------|

Arm description:

Pre-exercise placebo and post-exercise placebo

| | |
|----------|---------|
| Arm type | Placebo |
|----------|---------|

| | |
|--|--|
| Investigational medicinal product name | Saline |
| Investigational medicinal product code | |
| Other name | |
| Pharmaceutical forms | Concentrate and solvent for solution for injection |
| Routes of administration | Injection |

Dosage and administration details:

150-75 microgram of saline injected s.c.

| Number of subjects in period 1 | 150 microgram glucagon | 75 microgram glucagon | Placebo |
|---------------------------------------|------------------------|-----------------------|---------|
| Started | 22 | 22 | 22 |
| Completed | 22 | 22 | 22 |

Baseline characteristics

Reporting groups

| | |
|-----------------------|----------------------|
| Reporting group title | Study period overall |
|-----------------------|----------------------|

Reporting group description: -

| Reporting group values | Study period overall | Total | |
|---|----------------------|-------|--|
| Number of subjects | 22 | 22 | |
| Age categorical | | | |
| 18-64 years | | | |
| 65-84 years | | | |
| Units: Subjects | | | |
| In utero | 0 | 0 | |
| Preterm newborn infants (gestational age < 37 wks) | 0 | 0 | |
| Newborns (0-27 days) | 0 | 0 | |
| Infants and toddlers (28 days-23 months) | 0 | 0 | |
| Children (2-11 years) | 0 | 0 | |
| Adolescents (12-17 years) | 0 | 0 | |
| Adults (18-64 years) | 17 | 17 | |
| From 65-84 years | 5 | 5 | |
| 85 years and over | 0 | 0 | |
| Age continuous | | | |
| Units: years | | | |
| median | 57 | | |
| full range (min-max) | 22 to 79 | - | |
| Gender categorical | | | |
| Units: Subjects | | | |
| Female | 6 | 6 | |
| Male | 16 | 16 | |
| BMI | | | |
| Units: kilogram(s)/square metre | | | |
| median | 26.3 | | |
| full range (min-max) | 20.3 to 29.4 | - | |
| Type 1 diabetes duration | | | |
| Units: Years | | | |
| median | 30 | | |
| full range (min-max) | 2 to 63 | - | |
| HbA1C | | | |
| Units: mmol/l | | | |
| median | 53 | | |
| full range (min-max) | 42 to 66 | - | |
| HbA1c | | | |
| Units: Percentage | | | |
| median | 7.0 | | |
| full range (min-max) | 6.0 to 8.2 | - | |
| Total daily insulin dose | | | |
| Units: unit(s) | | | |
| median | 39 | | |

| | | | |
|----------------------|--------------|---|--|
| full range (min-max) | 12 to 73 | - | |
| Physical activities | | | |
| Units: METs/week | | | |
| median | 2561 | | |
| full range (min-max) | 240 to 13068 | - | |

End points

End points reporting groups

| | |
|--|------------------------|
| Reporting group title | 150 microgram glucagon |
| Reporting group description: | |
| Pre-exercise 150 µg s.c. glucagon and post-exercise placebo | |
| Reporting group title | 75 microgram glucagon |
| Reporting group description: | |
| Pre-exercise 75 µg s.c. glucagon and post-exercise 75 µg s.c. glucagon | |
| Reporting group title | Placebo |
| Reporting group description: | |
| Pre-exercise placebo and post-exercise placebo | |

Primary: Rate of hypoglycaemia (<3.9mmol/l)

| | |
|---|------------------------------------|
| End point title | Rate of hypoglycaemia (<3.9mmol/l) |
| End point description: | |
| | |
| End point type | Primary |
| End point timeframe: | |
| During exercise and post exercise resting phase (0-180 min) | |

| End point values | 150 microgram glucagon | 75 microgram glucagon | Placebo | |
|-----------------------------|------------------------|-----------------------|-----------------|--|
| Subject group type | Reporting group | Reporting group | Reporting group | |
| Number of subjects analysed | 22 | 22 | 22 | |
| Units: N | 7 | 5 | 6 | |

Statistical analyses

| | |
|---|--|
| Statistical analysis title | Logistic mixed effects regression model |
| Comparison groups | 150 microgram glucagon v 75 microgram glucagon v Placebo |
| Number of subjects included in analysis | 66 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | = 0.078 |
| Method | Regression, Logistic |

Secondary: Time below range (<3.9 mmol/L)

| | |
|------------------------|--------------------------------|
| End point title | Time below range (<3.9 mmol/L) |
| End point description: | |
| Unit: percentage point | |

| | |
|--|-----------|
| End point type | Secondary |
| End point timeframe: | |
| From exercise to post exercise (0-180 min) | |

| End point values | 150 microgram glucagon | 75 microgram glucagon | Placebo | |
|----------------------------------|------------------------|-----------------------|-----------------|--|
| Subject group type | Reporting group | Reporting group | Reporting group | |
| Number of subjects analysed | 22 | 22 | 22 | |
| Units: percent | | | | |
| arithmetic mean (standard error) | 3.3 (± 5.6) | 4.1 (± 8.7) | 5.2 (± 9.7) | |

Statistical analyses

| | |
|---|--|
| Statistical analysis title | Generalized linear mixed model |
| Comparison groups | 150 microgram glucagon v 75 microgram glucagon v Placebo |
| Number of subjects included in analysis | 66 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | = 0.359 |
| Method | Mixed models analysis |

Secondary: Time in range (3.9-10.0 mmol/L)

| | |
|---|---------------------------------|
| End point title | Time in range (3.9-10.0 mmol/L) |
| End point description: | |
| Unit: percentage point | |
| End point type | Secondary |
| End point timeframe: | |
| From Exercise and post exercise (0-180 min) | |

| End point values | 150 microgram glucagon | 75 microgram glucagon | Placebo | |
|--------------------------------------|------------------------|-----------------------|-----------------|--|
| Subject group type | Reporting group | Reporting group | Reporting group | |
| Number of subjects analysed | 22 | 22 | 22 | |
| Units: percent | | | | |
| arithmetic mean (standard deviation) | 63.9 (± 38.9) | 60.0 (± 34.1) | 82.7 (± 29.6) | |

Statistical analyses

| | |
|---|--|
| Statistical analysis title | Generalized linear mixed model |
| Comparison groups | 150 microgram glucagon v 75 microgram glucagon v Placebo |
| Number of subjects included in analysis | 66 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | = 0.005 |
| Method | Mixed models analysis |

| | |
|---|--|
| Statistical analysis title | Generalized linear mixed model |
| Comparison groups | 150 microgram glucagon v 75 microgram glucagon |
| Number of subjects included in analysis | 44 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | = 0.845 |
| Method | Mixed models analysis |

| | |
|---|----------------------------------|
| Statistical analysis title | Generalized linear mixed model |
| Comparison groups | 150 microgram glucagon v Placebo |
| Number of subjects included in analysis | 44 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | = 0.028 |
| Method | Mixed models analysis |

| | |
|---|---------------------------------|
| Statistical analysis title | Generalized linear mixed model |
| Comparison groups | Placebo v 75 microgram glucagon |
| Number of subjects included in analysis | 44 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | = 0.007 |
| Method | Mixed models analysis |

| | |
|--|---------------------------------|
| Secondary: Time above range (>10.0 mmol/L) | |
| End point title | Time above range (>10.0 mmol/L) |
| End point description: | |
| Unit: Percentage point | |
| End point type | Secondary |
| End point timeframe: | |
| From exercise and post exercise (0-180 min) | |

| End point values | 150 microgram glucagon | 75 microgram glucagon | Placebo | |
|----------------------------------|------------------------|-----------------------|--------------------|--|
| Subject group type | Reporting group | Reporting group | Reporting group | |
| Number of subjects analysed | 22 | 22 | 22 | |
| Units: Percent | | | | |
| arithmetic mean (standard error) | 32.2 (\pm 41.3) | 35.9 (\pm 36.4) | 13.2 (\pm 30.2) | |

Statistical analyses

| Statistical analysis title | Generalized linear mixed model |
|---|--|
| Comparison groups | 150 microgram glucagon v 75 microgram glucagon v Placebo |
| Number of subjects included in analysis | 66 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | = 0.007 |
| Method | Mixed models analysis |

| Statistical analysis title | Generalized linear mixed model |
|---|--|
| Comparison groups | 150 microgram glucagon v 75 microgram glucagon |
| Number of subjects included in analysis | 44 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | = 0.91 |
| Method | Mixed models analysis |

| Statistical analysis title | Generalized linear mixed model |
|---|----------------------------------|
| Comparison groups | Placebo v 150 microgram glucagon |
| Number of subjects included in analysis | 44 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | = 0.027 |
| Method | Mixed models analysis |

| Statistical analysis title | Generalized linear mixed model |
|-----------------------------------|---------------------------------|
| Comparison groups | Placebo v 75 microgram glucagon |

| | |
|---|-----------------------|
| Number of subjects included in analysis | 44 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | = 0.009 |
| Method | Mixed models analysis |

Secondary: Time to hypoglycaemia

| | |
|---|-----------------------|
| End point title | Time to hypoglycaemia |
| End point description: | |
| End point type | Secondary |
| End point timeframe: | |
| From exercise and post exercise (0-180 min) | |

| End point values | 150 microgram glucagon | 75 microgram glucagon | Placebo | |
|--------------------------------------|------------------------|-----------------------|-----------------|--|
| Subject group type | Reporting group | Reporting group | Reporting group | |
| Number of subjects analysed | 22 | 22 | 22 | |
| Units: minute | | | | |
| arithmetic mean (standard deviation) | 80.0 (± 35.7) | 46.0 (± 10.8) | 47.5 (± 43.8) | |

Statistical analyses

| | |
|---|--|
| Statistical analysis title | Non parametric test |
| Comparison groups | 150 microgram glucagon v 75 microgram glucagon v Placebo |
| Number of subjects included in analysis | 66 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | = 0.49 |
| Method | Friedmanns Non parametric test |

Secondary: Change in plasma glucose over time

| | |
|---|------------------------------------|
| End point title | Change in plasma glucose over time |
| End point description: | |
| End point type | Secondary |
| End point timeframe: | |
| From exercise and post exercise (0-180 min) | |

| End point values | 150 microgram glucagon | 75 microgram glucagon | Placebo | |
|--------------------------------------|------------------------|-----------------------|-----------------|--|
| Subject group type | Reporting group | Reporting group | Reporting group | |
| Number of subjects analysed | 22 | 22 | 22 | |
| Units: mmol/l | | | | |
| arithmetic mean (standard deviation) | 0.03 (± 2.0) | 0.76 (± 2.9) | -0.08 (± 1.8) | |

Statistical analyses

| Statistical analysis title | Generalized linear mixed model |
|---|--|
| Comparison groups | 150 microgram glucagon v 75 microgram glucagon v Placebo |
| Number of subjects included in analysis | 66 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | = 0.419 |
| Method | Mixed models analysis |

Secondary: Mean Plasma glucose

| | |
|---|---------------------|
| End point title | Mean Plasma glucose |
| End point description: | |
| End point type | Secondary |
| End point timeframe: | |
| From exercise and post exercise (0-180 min) | |

| End point values | 150 microgram glucagon | 75 microgram glucagon | Placebo | |
|--------------------------------------|------------------------|-----------------------|-----------------|--|
| Subject group type | Reporting group | Reporting group | Reporting group | |
| Number of subjects analysed | 22 | 22 | 22 | |
| Units: mmol/l | | | | |
| arithmetic mean (standard deviation) | 10.1 (± 2.8) | 10.8 (± 3.3) | 8.8 (± 2.6) | |

Statistical analyses

| Statistical analysis title | Generalized linear mixed model |
|----------------------------|--|
| Comparison groups | 150 microgram glucagon v 75 microgram glucagon v Placebo |

| | |
|---|-----------------------|
| Number of subjects included in analysis | 66 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | = 0.015 |
| Method | Mixed models analysis |

| | |
|---|--|
| Statistical analysis title | Copy of Generalized linear mixed model |
| Comparison groups | 150 microgram glucagon v 75 microgram glucagon |
| Number of subjects included in analysis | 44 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | = 0.787 |
| Method | Mixed models analysis |

| | |
|---|--|
| Statistical analysis title | Copy of Copy of Generalized linear mixed model |
| Comparison groups | 150 microgram glucagon v Placebo |
| Number of subjects included in analysis | 44 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | = 0.076 |
| Method | Mixed models analysis |

| | |
|---|--|
| Statistical analysis title | Copy of Copy of Copy of Generalized linear mixe... |
| Comparison groups | Placebo v 75 microgram glucagon |
| Number of subjects included in analysis | 44 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | = 0.016 |
| Method | Mixed models analysis |

Secondary: Hyperglycaemic events

| | |
|---|-----------------------|
| End point title | Hyperglycaemic events |
| End point description: | |
| End point type | Secondary |
| End point timeframe: | |
| From exercise and post exercise (0-180 min) | |

| End point values | 150 microgram glucagon | 75 microgram glucagon | Placebo | |
|-----------------------------|------------------------|-----------------------|-----------------|--|
| Subject group type | Reporting group | Reporting group | Reporting group | |
| Number of subjects analysed | 22 | 22 | 22 | |
| Units: N | 11 | 15 | 5 | |

Statistical analyses

| Statistical analysis title | Generalized linear mixed model |
|---|--|
| Comparison groups | 150 microgram glucagon v 75 microgram glucagon v Placebo |
| Number of subjects included in analysis | 66 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | = 0.011 |
| Method | Mixed models analysis |

| Statistical analysis title | Generalized linear mixed model |
|---|--|
| Comparison groups | 150 microgram glucagon v 75 microgram glucagon |
| Number of subjects included in analysis | 44 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | = 0.412 |
| Method | Mixed models analysis |

| Statistical analysis title | Generalized linear mixed model |
|---|----------------------------------|
| Comparison groups | 150 microgram glucagon v Placebo |
| Number of subjects included in analysis | 44 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | = 0.137 |
| Method | Mixed models analysis |

| Statistical analysis title | Generalized linear mixed model |
|---|---------------------------------|
| Comparison groups | Placebo v 75 microgram glucagon |
| Number of subjects included in analysis | 44 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | = 0.009 |
| Method | Mixed models analysis |

Secondary: Nadir

| | |
|-----------------|-------|
| End point title | Nadir |
|-----------------|-------|

End point description:

| | |
|----------------|-----------|
| End point type | Secondary |
|----------------|-----------|

End point timeframe:

From exercise and post exercise

| End point values | 150 microgram glucagon | 75 microgram glucagon | Placebo | |
|--------------------------------------|------------------------|-----------------------|-----------------|--|
| Subject group type | Reporting group | Reporting group | Reporting group | |
| Number of subjects analysed | 22 | 22 | 22 | |
| Units: mmol/l | | | | |
| arithmetic mean (standard deviation) | 6.6 (± 2.7) | 7.0 (± 2.8) | 6.0 (± 2.6) | |

Statistical analyses

| | |
|---|--|
| Statistical analysis title | Generalized linear mixed model |
| Comparison groups | 150 microgram glucagon v 75 microgram glucagon v Placebo |
| Number of subjects included in analysis | 66 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | = 0.223 |
| Method | Mixed models analysis |

Secondary: Peak

| | |
|-----------------|------|
| End point title | Peak |
|-----------------|------|

End point description:

| | |
|----------------|-----------|
| End point type | Secondary |
|----------------|-----------|

End point timeframe:

From exercise and post exercise (0-180 min)

| End point values | 150 microgram glucagon | 75 microgram glucagon | Placebo | |
|--------------------------------------|------------------------|-----------------------|-----------------|--|
| Subject group type | Reporting group | Reporting group | Reporting group | |
| Number of subjects analysed | 22 | 22 | 22 | |
| Units: mmol/l | | | | |
| arithmetic mean (standard deviation) | 10.1 (± 2.8) | 10.8 (± 3.3) | 8.8 (± 2.6) | |

Statistical analyses

| | |
|---|--|
| Statistical analysis title | generalized linear mixed model |
| Comparison groups | 150 microgram glucagon v 75 microgram glucagon v Placebo |
| Number of subjects included in analysis | 66 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | = 0.005 |
| Method | Mixed models analysis |

| | |
|---|--|
| Statistical analysis title | Generalized linear mixed model |
| Comparison groups | 150 microgram glucagon v 75 microgram glucagon |
| Number of subjects included in analysis | 44 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | = 0.511 |
| Method | Mixed models analysis |

| | |
|---|----------------------------------|
| Statistical analysis title | Generalized linear mixed model |
| Comparison groups | 150 microgram glucagon v Placebo |
| Number of subjects included in analysis | 44 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | = 0.063 |
| Method | Mixed models analysis |

| | |
|---|---------------------------------|
| Statistical analysis title | Generalized linear mixed model |
| Comparison groups | Placebo v 75 microgram glucagon |
| Number of subjects included in analysis | 44 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | = 0.004 |
| Method | Mixed models analysis |

Secondary: Incemental peak

| | |
|-----------------|-----------------|
| End point title | Incemental peak |
|-----------------|-----------------|

End point description:

| | |
|----------------|-----------|
| End point type | Secondary |
|----------------|-----------|

End point timeframe:

From exercise and post exercise (0-180 min)

| End point values | 150 microgram glucagon | 75 microgram glucagon | Placebo | |
|--------------------------------------|------------------------|-----------------------|-----------------|--|
| Subject group type | Reporting group | Reporting group | Reporting group | |
| Number of subjects analysed | 22 | 22 | 22 | |
| Units: mmol/l | | | | |
| arithmetic mean (standard deviation) | 2.4 (± 1.4) | 2.7 (± 1.9) | 1.2 (± 1.4) | |

Statistical analyses

| | |
|---|--|
| Statistical analysis title | Generalized linear mixed model |
| Comparison groups | 150 microgram glucagon v 75 microgram glucagon v Placebo |
| Number of subjects included in analysis | 66 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | < 0 |
| Method | Mixed models analysis |

| | |
|---|--|
| Statistical analysis title | Generalized linear mixed model |
| Comparison groups | 150 microgram glucagon v 75 microgram glucagon |
| Number of subjects included in analysis | 44 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | = 0.75 |
| Method | Mixed models analysis |

| | |
|-----------------------------------|----------------------------------|
| Statistical analysis title | Generalized linear mixed model |
| Comparison groups | 150 microgram glucagon v Placebo |

| | |
|---|-----------------------|
| Number of subjects included in analysis | 44 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | = 0.01 |
| Method | Mixed models analysis |

| | |
|---|---------------------------------|
| Statistical analysis title | Generalized linear mixed model |
| Comparison groups | Placebo v 75 microgram glucagon |
| Number of subjects included in analysis | 44 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | < 0.001 |
| Method | Mixed models analysis |

Secondary: AUC

| | |
|---------------------------------|-----------|
| End point title | AUC |
| End point description: | |
| End point type | Secondary |
| End point timeframe: | |
| From exercise and post exercise | |

| End point values | 150 microgram glucagon | 75 microgram glucagon | Placebo | |
|--------------------------------------|------------------------|-----------------------|------------------|--|
| Subject group type | Reporting group | Reporting group | Reporting group | |
| Number of subjects analysed | 22 | 22 | 22 | |
| Units: mmol/l*min | | | | |
| arithmetic mean (standard deviation) | 1565.5 (± 542.8) | 1720.9 (± 584.5) | 1357.3 (± 497.0) | |

Statistical analyses

| | |
|---|--|
| Statistical analysis title | Generalized linear mixed model |
| Comparison groups | 150 microgram glucagon v 75 microgram glucagon v Placebo |
| Number of subjects included in analysis | 66 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | < 0 |
| Method | Mixed models analysis |

| | |
|---|--|
| Statistical analysis title | Generalized linear mixed model |
| Comparison groups | 150 microgram glucagon v 75 microgram glucagon |
| Number of subjects included in analysis | 44 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | = 0.215 |
| Method | Mixed models analysis |

| | |
|---|----------------------------------|
| Statistical analysis title | Generalized linear mixed model |
| Comparison groups | 150 microgram glucagon v Placebo |
| Number of subjects included in analysis | 44 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | = 0.061 |
| Method | Mixed models analysis |

| | |
|---|---------------------------------|
| Statistical analysis title | Generalized linear mixed model |
| Comparison groups | Placebo v 75 microgram glucagon |
| Number of subjects included in analysis | 44 |
| Analysis specification | Pre-specified |
| Analysis type | superiority |
| P-value | < 0.001 |
| Method | Mixed models analysis |

Adverse events

Adverse events information

Timeframe for reporting adverse events:

From intervention (t=0) to the end of the observation period (t=180 min)

Adverse event reporting additional description:

Adverse effects (nausea, headache, stomachache, palpitations and injection site pain) were scored using a 0-100 visual analog scale (VAS) just prior to the intervention (t=0), after exercise (t=60 min) and two hours later (t=180) to evaluate whether any adverse events had occurred within three/two hours after the intervention.

| | |
|-----------------|------------|
| Assessment type | Systematic |
|-----------------|------------|

Dictionary used

| | |
|-----------------|------|
| Dictionary name | None |
|-----------------|------|

| | |
|--------------------|---|
| Dictionary version | 0 |
|--------------------|---|

Reporting groups

| | |
|-----------------------|-------------------------------|
| Reporting group title | 150 microgram glucagon (G150) |
|-----------------------|-------------------------------|

Reporting group description: -

| | |
|-----------------------|---------------------------------|
| Reporting group title | 75*2 microgram glucagon (G75*2) |
|-----------------------|---------------------------------|

Reporting group description: -

| | |
|-----------------------|---------------|
| Reporting group title | Placebo (PBO) |
|-----------------------|---------------|

Reporting group description: -

| Serious adverse events | 150 microgram glucagon (G150) | 75*2 microgram glucagon (G75*2) | Placebo (PBO) |
|---|-------------------------------|---------------------------------|----------------|
| Total subjects affected by serious adverse events | | | |
| subjects affected / exposed | 0 / 22 (0.00%) | 0 / 22 (0.00%) | 0 / 22 (0.00%) |
| number of deaths (all causes) | 0 | 0 | 0 |
| number of deaths resulting from adverse events | 0 | 0 | 0 |

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

| Non-serious adverse events | 150 microgram glucagon (G150) | 75*2 microgram glucagon (G75*2) | Placebo (PBO) |
|---|-------------------------------|---------------------------------|-----------------|
| Total subjects affected by non-serious adverse events | | | |
| subjects affected / exposed | 4 / 22 (18.18%) | 5 / 22 (22.73%) | 7 / 22 (31.82%) |
| Cardiac disorders | | | |
| Palpitations | | | |
| subjects affected / exposed | 2 / 22 (9.09%) | 1 / 22 (4.55%) | 1 / 22 (4.55%) |
| occurrences (all) | 2 | 1 | 1 |
| General disorders and administration site conditions | | | |

| | | | |
|--|----------------------|----------------------|-----------------------|
| Headache subjects affected / exposed occurrences (all) | 4 / 22 (18.18%) 5 | 3 / 22 (13.64%) 4 | 5 / 22 (22.73%) 11 |
| Gastrointestinal disorders | | | |
| Nausea subjects affected / exposed occurrences (all) | 2 / 22 (9.09%) 2 | 1 / 22 (4.55%) 1 | 0 / 22 (0.00%) 0 |
| Abdominal pain subjects affected / exposed occurrences (all) | 0 / 22 (0.00%) 0 | 0 / 22 (0.00%) 0 | 1 / 22 (4.55%) 1 |

More information

Substantial protocol amendments (globally)

Were there any global substantial amendments to the protocol? No

Interruptions (globally)

Were there any global interruptions to the trial? No

Limitations and caveats

None reported