



Clinical Study Synopsis for Public Disclosure

This clinical study synopsis is provided in line with **Boehringer Ingelheim's Policy on Transparency and Publication of Clinical Study Data**.


The synopsis - which is part of the clinical study report - had been prepared in accordance with best practice and applicable legal and regulatory requirements at the time of study completion.


The synopsis may include approved and non-approved uses, doses, formulations, treatment regimens and/or age groups; it has not necessarily been submitted to regulatory authorities.


A synopsis is not intended to provide a comprehensive analysis of all data currently available regarding a particular drug. More current information regarding a drug is available in the approved labeling information which may vary from country to country.


Additional information on this study and the drug concerned may be provided upon request based on **Boehringer Ingelheim's Policy on Transparency and Publication of Clinical Study Data**.

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Name of company: Boehringer Ingelheim		Tabulated Trial Report		 Boehringer Ingelheim Synopsis No.:										
Name of finished product: Faldepravir		EudraCT No.: 2009-012429-12												
Name of active ingredient: BI 201335		Page: 1 of 11												
Module:		Volume:												
Report date: 17 JUL 2013	Trial No. / U No.: 1220.9 / U13-1974-01	Date of trial: 18 JAN 2010 – 17 MAR 2010	Date of revision: Not applicable											
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Title of trial: An open label fixed sequence Phase I study to investigate the effect of BI 201335 mediated UGT1A1 inhibition on the multiple oral dose pharmacokinetics of raltegravir (Isentress®) in healthy male and female volunteers														
Principal Investigator: [REDACTED]														
Trial sites: [REDACTED] Germany														
Publication (reference): None														
Clinical phase: I														
Objectives: To investigate the effect of UGT1A1 inhibition by single and multiple oral doses of BI 201335 on the single and multiple oral dose pharmacokinetics of raltegravir and to investigate safety and tolerability														
Methodology: Open label fixed-sequence intra-individual comparison in healthy male and female volunteers.														
No. of subjects:														
<table style="width: 100%; border: none;"> <tr> <td style="padding-left: 20px;">planned:</td> <td>entered: 24</td> </tr> <tr> <td style="padding-left: 20px;">actual:</td> <td>enrolled: 24</td> </tr> <tr> <td></td> <td>entered: 24</td> </tr> <tr> <td></td> <td>treated: 24</td> </tr> <tr> <td></td> <td>analysed (for primary endpoint): 24</td> </tr> </table>					planned:	entered: 24	actual:	enrolled: 24		entered: 24		treated: 24		analysed (for primary endpoint): 24
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actual:	enrolled: 24													
	entered: 24													
	treated: 24													
	analysed (for primary endpoint): 24													
Diagnosis and main criteria for inclusion: Healthy male and female volunteers, age ≥ 21 and ≤ 50 years, BMI range: ≥ 18.5 and ≤ 29.9 kg/m ²														


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Test product:	BI 201335 240 mg soft gelatine capsules Raltegravir (Isentress®) 400 mg film covered tablet			
dose:	BI 201335: 480 mg loading dose, followed by 240 mg on day 6 (4-0-2) 240 mg b.i.d. on days 7 to 14 (2-0-2) 240 mg q.d. on day 15 (2-0-0) Raltegravir: 400 mg b.i.d. on day 1 to day 14 (1-0-1) 400 mg q.d. on day 15 (1-0-0)			
mode of admin.:	Oral administration with 240 mL water			
batch no.:	BI 201335: 08JM-214 Raltegravir: NK14080			
Reference therapy:	Not applicable			
dose:				
mode of admin.:				
batch no.:				
Duration of treatment:	BI 201335: 10 days for each subject Raltegravir: 15 days for each subject			

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Criteria for evaluation:				
Efficacy / pharmacokinetic:		Primary endpoints: <ul style="list-style-type: none"> Raltegravir pharmacokinetic parameters: C_{max} and $AUC_{0-\infty}$ Secondary endpoints: <ul style="list-style-type: none"> Raltegravir pharmacokinetic parameters: AUC_{0-tz}, t_{max}, λ_z, $t_{1/2}$, MRT_{po}, CL/F, V_z/F 		
Safety:		Physical examination, vital signs (BP and PR), 12-lead ECG, laboratory tests, adverse events, assessment of tolerability by investigator		
Statistical methods:		For the primary analyses, point estimators (geometric means) of the median intrasubject ratios of $AUC_{0-\infty}$ and C_{max} and their two-sided 90% confidence intervals (CIs) were derived. For the secondary analyses, descriptive statistics and tabular and graphical displays were used to summarize and evaluate the secondary endpoints.		
SUMMARY – CONCLUSIONS:				

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Clinical pharmacology results:	<p>The bioanalytical work at the Lab21 site in Cambridge, UK, including method validation and sample analysis, for the analytes raltegravir and raltegravir glucuronide were audited by the sponsor). At the conclusion of the audit it was determined that the data were not reportable as GCP compliant due to a number of compliance and documentation issues found in the validation and sample reports.</p>																																																																																																																	
	<p>BI 201335:</p> <p>The noncompartmental pharmacokinetics of BI 201335 in plasma after 3 and 19 doses of BI 201335 240 mg (study days 7 and 15, respectively) are summarized in the following table. Steady-state plasma BI 201335 concentrations appear to be achieved after 7-9 days of dosing</p>																																																																																																																	
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	<p>Raltegravir</p> <p>After 3 doses of BI 201335 NA (480 mg loading dose, then 240 mg q12h), steady-state raltegravir geometric mean $C_{max,ss}$, $AUC_{0-12,ss}$ and $C_{12,ss}$ increased approximately 49%, 59% and 113%, respectively, relative to raltegravir alone; arithmetic mean half-life was unchanged (2.50 h vs. 2.45 h). With continued dosing of BI 201335 NA to steady-state, raltegravir geometric mean $C_{max,ss}$ was now unchanged, and $AUC_{0-12,ss}$ and $C_{12,ss}$ increased 19% and 56%, respectively, relative to raltegravir alone; arithmetic mean half-life increased approximately 39% (3.40 h vs. 2.45 h).</p>						
	$C_{max,ss}$	$AUC_{0-12,ss}$	$C_{12,ss}$	$t_{max,ss}$	$t_{1/2,ss}$	$CL/F_{,ss}$	$Vz/F_{,ss}$
	[nmol/L]	[µmol·h/L]	[nmol/L]	[h]	[h]	[L/h]	[L]
	Day 5 (raltegravir 400 mg alone)						
N	24	24	24	24	24	24	24
gMean	2100	7.62	92.5	3.82	2.16	118	367
gCV [%]	88.6	74.9	178	70.0	55.0	74.9	134
Mean	2820	9.39	200	4.43	2.45	145	559
CV [%]	85.6	66.0	170	48.4	53.5	63.1	85.8
SD	2420	6.19	340	2.15	1.31	91.2	480
Min	685	2.64	18.2	0.517	0.885	36.7	58.1
Median	1860	7.55	72.0	5.00	2.06	119	397
Max	9510	24.5	1640	10.0	5.90	341	1770
	Day 7 (raltegravir 400 mg after 3 doses of BI 201335 NA)						
N	24	24	24	24	24	24	24
gMean	3120	12.1	197	4.51	2.16	74.6	232
gCV [%]	123	104	172	43.1	57.8	104	185
Mean	4860	16.2	387	4.90	2.50	107	477
CV [%]	103	68.9	146	44.7	60.4	91.2	130
SD	5030	11.2	566	2.19	1.51	97.8	619
Min	642	2.67	28.0	2.02	1.01	21.1	39.6
Median	3140	14.1	240	4.91	2.22	63.6	232
Max	21000	42.7	2690	11.9	6.04	337	1980

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	Day 15 (raltegravir 400 mg with steady-state BI 201335 NA)							
	N	23	23	23	23	23	23	
	gMean	2110	9.05	144	3.70	2.72	99.4	390
	gCV [%]	73.5	70.7	117	52.8	66.5	70.7	139
	Mean	2680	11.1	242	4.15	3.40	119	614
	CV [%]	86.8	71.3	141	49.9	94.7	59.4	99.8
	SD	2330	7.91	342	2.07	3.22	70.6	613
	Min	741	2.96	35.9	1.50	1.36	30.0	60.3
	Median	1800	8.87	96.6	4.05	2.29	101	491
	Max	11000	30.0	1530	9.98	16.7	304	2790
	Raltegravir-glucuronide							
	<p>After 3 doses of BI 201335 NA (480 mg loading dose, then 240 mg q12h), steady-state raltegravir-glucuronide geometric mean $C_{max,ss}$, $AUC_{0-12,ss}$ and $C_{12,ss}$ increased approximately 18%, 45% and 209%, respectively, relative to raltegravir alone; arithmetic mean half-life was increased approximately 59% (3.59 h vs. 2.26 h). Relative to raltegravir alone, the geometric mean metabolite-to-parent ratios (raltegravir-glucuronide: raltegravir) for $C_{max,ss}$, $AUC_{0-12,ss}$ and $C_{12,ss}$ at steady-state decreased approximately 20% and 8%, and increased approximately 44%, respectively.</p> <p>With continued dosing of BI 201335 NA to steady-state, raltegravir-glucuronide geometric mean $C_{max,ss}$ was now unchanged (2% increase), and $AUC_{0-12,ss}$ and $C_{12,ss}$ increased 41% and 138%, respectively, relative to raltegravir alone; arithmetic mean half-life was increased approximately 46% (3.31 h vs. 2.26 h). Relative to raltegravir alone, the geometric mean metabolite-to-parent ratios (raltegravir-glucuronide: raltegravir) for $C_{max,ss}$, $AUC_{0-12,ss}$ and $C_{12,ss}$ at steady-state was now unchanged (2% increase), and increased 18% and 52%, respectively.</p>							

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	$C_{max,ss}$ [nmol/L]	$AUC_{0-12,ss}$ [μ mol·h/L]	$C_{12,ss}$ [nmol/L]	$t_{max,ss}$ [h]	$t_{1/2,s}$ [h]	Ratio $C_{12,ss,M}/$ P	Ratio $C_{max,ss,}$ M/P	Ratio AUC_{τ} ss,M/P
Day 5 (raltegravir 400 mg alone)								
N	24	24	24	24	24	24	24	24
gMean	1250	5.58	95.8	4.89	1.94	1.04	0.593	0.731
gCV [%]	64.8	61.0	212	48.0	49.1	50.3	38.4	32.0
Mean	1490	6.51	206	5.35	2.26	1.16	0.634	0.765
CV [%]	65.3	60.4	123	39.9	86.0	52.9	38.7	30.4
SD	971	3.93	253	2.13	1.94	0.613	0.245	0.233
Min	429	2.07	10.1	2.00	1.10	0.383	0.301	0.370
Median	1170	5.60	82.8	5.98	1.83	1.06	0.593	0.727
Max	4090	16.9	869	10.0	11.0	3.31	1.37	1.30
Day 7 (raltegravir 400 mg after 3 doses of BI 201335 NA)								
N	24	24	24	24	24	24	24	24
gMean	1480	8.09	296	---	3.09	1.50	0.473	0.670
gCV [%]	78.3	74.9	154	---	54.4	40.3	50.1	32.3
Mean	1820	9.78	487	5.51	3.59	1.61	0.527	0.704
CV [%]	61.1	57.1	91.9	53.9	70.1	35.8	50.5	33.4
SD	1110	5.59	448	2.97	2.52	0.576	0.266	0.235
Min	443	2.41	56.8	0	1.73	0.627	0.193	0.367
Median	1540	10.3	320	5.43	2.62	1.59	0.466	0.651
Max	4060	20.1	1690	11.9	12.1	2.87	1.19	1.33
Day 15 (raltegravir 400 mg with steady-state BI 201335 NA)								
N	23	23	23	23	23	23	23	23
gMean	1270	7.84	228	---	3.05	1.58	0.602	0.866
gCV [%]	62.4	57.2	103	---	40.7	43.1	28.4	24.7
Mean	1510	8.99	344	3.91	3.31	1.70	0.624	0.890
CV [%]	68.0	55.4	115	69.5	47.1	39.5	26.5	23.1
SD	1030	4.98	396	2.72	1.56	0.674	0.165	0.206
Min	488	2.86	84.2	0	1.62	0.716	0.304	0.526
Median	1160	7.24	173	3.97	3.12	1.54	0.640	0.920
Max	4950	22.0	1530	8.03	8.20	2.82	0.962	1.21


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	<p>Effect of UGT1A1 genotype and BI 201335 on raltegravir</p> <p>For subjects with wild type UGT1A1 genotype (N=4), steady-state raltegravir $C_{max,ss}$, $AUC_{0-12,ss}$ and $C_{12,ss}$ increased approximately 27%, 38% and 14% relative to raltegravir alone, respectively, when co-administered with BI 201335 NA on day 7 (3rd dose of BI 201335). When co-administered with steady-state BI 201335 NA on day 15, $C_{max,ss}$, $AUC_{0-12,ss}$ and $C_{12,ss}$ increased approximately 48%, 79% and 80% relative to raltegravir alone, respectively.</p> <p>For subjects with possibly reduced UGT1A1 activity (N=14), steady-state raltegravir $C_{max,ss}$, $AUC_{0-12,ss}$ and $C_{12,ss}$ increased approximately 58%, 64% and 145% relative to raltegravir alone, respectively, when co-administered with BI 201335 NA on day 7 (3rd dose of BI 201335). When co-administered with steady-state BI 201335 NA on day 15, raltegravir $C_{max,ss}$ decreased 12%, $AUC_{0-12,ss}$ was unchanged (3% increase) and $C_{12,ss}$ increased 41%, relative to raltegravir alone.</p> <p>For subjects with reduced UGT1A1 activity (N=6), steady-state raltegravir $C_{max,ss}$, $AUC_{0-12,ss}$ and $C_{12,ss}$ increased approximately 43%, 61% and 134% relative to raltegravir alone, respectively, when co-administered with BI 201335 NA on day 7 (3rd dose of BI 201335). When co-administered with steady-state BI 201335 NA on day 15, $C_{max,ss}$ was unchanged (3% increase), and $AUC_{0-12,ss}$ and $C_{12,ss}$ increased 24% and 75%, respectively, relative to raltegravir alone.</p> <p>Effect of BI 201335 NA on raltegravir pharmacokinetics</p> <p>With the third dose of BI 201335 (Day 7), raltegravir $AUC_{0-12,ss}$, $C_{max,ss}$, and $C_{12,ss}$ increased 58%, 48% and 113%, respectively. After 19 doses of BI 201335 (Day15), raltegravir $AUC_{0-12,ss}$ and $C_{12,ss}$ increased 19% and 56%, respectively, with no change in $C_{max,ss}$.</p> <p>Summary of geometric mean ratios and 90% CIs for raltegravir and raltegravir glucuronide for raltegravir 400 mg coadministered with BI 201335 240 mg</p>
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	N	gMean	N	gMean	Ratio ^a	
					(%)	90% CI
Raltegravir	Day 7		Day 5			
AUC _{0-12,ss} [µmol·h/L]	24	12.1	24	7.62	158	127, 197
C _{max,ss} [nmol/L]	24	3123	24	2104	148	116, 190
C _{12,ss} [nmol/L]	24	197	24	92.5	213	137, 332
	Day 15		Day 5			
AUC _{0-12,ss} [µmol·h/L]	23	9.05	24	7.62	119	92.5, 152
C _{max,ss} [nmol/L]	23	2105	24	2104	100	75.6, 132
C _{12,ss} [nmol/L]	23	144	24	92.5	156	98.7, 245
Raltegravir glucuronide	Day 7		Day 5			
AUC _{0-12,ss} [µmol·h/L]	24	8.09	24	5.58	145	118, 179
C _{max,ss} [nmol/L]	24	1476	24	1249	118	95.7, 146
C _{12,ss} [nmol/L]	24	296	24	95.8	309	202, 473
	Day 15		Day 5			
AUC _{0-12,ss} [µmol·h/L]	23	7.89	24	5.58	141	115, 174
C _{max,ss} [nmol/L]	23	1276	24	1249	102	83.4, 125
C _{12,ss} [nmol/L]	23	227	24	95.8	237	148, 380

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Safety results:	<p>During the treatment phase with raltegravir alone, 8 (33.8%) out of 24 subjects reported any AE, and a total of 21 (87.5%) subjects reported any AE during the treatment with raltegravir and BI 201335.</p> <p>The system organ classes (SOC) most affected were the SOC nervous system disorders during the treatment phase of dosing with raltegravir alone, and the SOC's gastrointestinal disorders, eye disorders (including ocular icterus) and nervous system disorders during raltegravir + BI 201335 NA dosing.</p> <p>The majority of AEs were nausea, reported by 16 (66.7%) subjects, ocular icterus reported by 11 (45.8%) subjects, headache reported by 10 (42.7%) subjects, fatigue reported by 8 (33.3%) subjects, dizziness, reported by 5 (20.8%) subjects, and ocular hyperaemia by 5 (20.8%) subjects.</p> <p>Vital signs did not show any relevant changes during the observation period.</p> <p>Consistent with previous observations, total bilirubin values increased in all subject during the combination treatment period. This increase was caused primarily by increases in the indirect bilirubin fraction as a result of inhibition of UGT1A1 by BI 201335, this is evident from that the ratio direct to total bilirubin was never above 0.4 for all subjects.</p> <p>There were 2 subjects showing ALT values >3 ULN, one also with total bilirubin values >2x ULN based on increased indirect bilirubin, during the treatment phase. In addition, 2 subjects showed ALT values >2x ULN on Day 16. All subjects were followed up until the values for ALT and bilirubin values reached again the normal ranges. For further several subjects, liver enzymes were above normal during the period of combined treatment but not above >2x ULN.</p> <p>For none of the subjects the criteria for Hy's law were met.</p> <p>Overall tolerability was assessed as satisfactory for the majority of the subjects. For 2 subjects, the overall tolerability was assessed as not satisfactory because of ongoing mild/moderate headaches of long duration throughout the treatment period and due to moderate dizziness, nausea and fatigue during a long duration throughout the treatment period, respectively.</p> <p>One subject discontinued the treatment period on Day13 after the evening dose due to ongoing moderate headache for several days.</p>
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Conclusions:	<p><u>Bioanalysis</u> The bioanalytical work at the Lab21 site in Cambridge, UK, including method validation and sample analysis, for the analytes raltegravir and raltegravir glucuronide were audited by personnel from DMPK, BIPI and QA, BI-GB-B (May 22-24, 2012). At the conclusion of the audit it was determined that the data were not reportable as GCP compliant due to a number of compliance and documentation issues found in the validation and sample reports.</p> <p><u>Clinical pharmacology conclusion</u> BI 201335 appears to affect raltegravir pharmacokinetics in a time-dependent manner. With 3 doses of BI 201335 (480 mg loading dose, then two 240 mg doses at 12 h intervals), raltegravir $AUC_{0-12,ss}$, $C_{max,ss}$, and $C_{12,ss}$ were increased relative to raltegravir alone (geometric mean ratio (90% CI): $AUC_{0-12,ss}$: 1.58 (1.27, 1.97), $C_{max,ss}$: 1.48 (1.16, 1.90), $C_{12,ss}$: 2.13 (1.37, 3.32)). However, with steady-state BI 201335, the changes in raltegravir $AUC_{0-12,ss}$, $C_{max,ss}$, and $C_{12,ss}$ were not as large (geometric mean ratio (90% CI): $AUC_{0-12,ss}$: 1.19 (0.93, 1.52), $C_{max,ss}$: 1.00 (0.76, 1.32), $C_{12,ss}$: 1.56 (0.99, 2.45)).</p> <p>The effect of BI 201335 NA on the activity of UGT1A1 using raltegravir as the probe drug substrate, and measuring the effect on raltegravir glucuronide pharmacokinetics, is inconclusive due to the high variability associated with raltegravir values. With both short-term and steady-state dosing of BI 201335, raltegravir glucuronide $AUC_{0-12,ss}$ increased about 40% with similar variability (geometric mean ratio (90% CI); 3 doses of BI 201335: 1.45 (1.18, 1.79); steady-state BI 201335: 1.41 (1.15, 1.74)).</p> <p><u>Safety</u> Overall global tolerability was assessed as satisfactory.</p>
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