CLINICAL PHARMACOLOGY REVIEW

BLA	103976/5149
Submission Date(s)	December 57, 2008
Brand Name	Xolair®
Generic Name	Omalizumab
Reviewers	Sang M. Chung, Ph.D.
Team Leader (Acting)	Partha Roy, Ph.D.
OCP Division	Clinical Pharmacology II
OND Division	Pulmonary and Allergy Products
Sponsor	Genentech/Novartis
Submission Type	Standard
Formulation Strength(s)	Vial contains 202.5 mg omalizumab lyophilized powder and is to deliver 150 mg omalizumab in 1.2 mL for subcutaneous injection with sterile water reconstitution
Indication	Allergic asthma
Dosage & Administration (proposed pediatric)	Doses (75 mg to 375 mg) and dosing frequency (every 2 weeks or every 4 weeks) are based on serum total IgE concentrations and body weight, and refer to the dosing table.

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1 Executive Summary

1.1 Recommendation

The Office of Clinical Pharmacology / Division of Clinical Pharmacology II (OCP/DCP II) has reviewed BLA103976/65149 for Xolair® (omalizumab) and would like to communicate the following comments to the medical officer.

Comments to the Medical Officer:

(b) (4)

1.2 Phase IV Commitments

(b) (4)

1.3 Summary of Important Clinical Pharmacology Findings

Xolair® (omalizumab) has been approved by the Agency since June 20, 2003 for the allergic asthma in adults and adolescents (>12 years of age). Omalizumab is a recombinant DNA-derived humanized IgG1κ monoclonal antibody and it binds to human immunoglobulin E (IgE). The molecular weight of omalizumab is 149 kilodlatons and is produced by a Chinese hamster ovary cell suspension culture. Omalizumab inhibits the binding of IgE to IgE receptor (FcεRI) on the surface of mast cells and basophils. Therefore, the omalizumab is expected to limit the degree of release of mediators of the allergic response from the FcεRI bearing cells. Xolair is a sterile, lyophilized powder for subcutaneous injection with sterile water reconstitution.

This submission is a pediatric efficacy supplement to expand the approved indication to patients 6 - < 12 years of age based on results of Phase III study (Study IA05). The formulation used in the pivotal clinical study (IA05) was the same as the commercial product approved under BLA 103976.

There was no new clinical pharmacology study other than the pivotal clinical trial in this submission. The sponsor conducted PK/PD modeling and simulation on pooled data from the pivotal clinical study (IA05), and previously conducted pediatric (010) and adolescent/adult studies (008, 009, 011, and 2204) to provide the following information:

- Prediction of omalizumab disposition,
- Estimation of free IgE, total IgE (fee IgE+omalizumab bound IgE), and omalizumab concentrations at any time point,
- Prediction of total IgE increase,
- Prediction of free IgE suppression.

The sponsor explored the correlation between clinical and PK/PD data collected in studies IA05 and 010, and concluded that there was a nonlinear empirical relationship between free IgE concentrations and symptoms or peak flow with a lag time.

Based on the modeling and simulation, the sponsor concluded that pediatric parameters of omalizumab pharmacokinetics and pharmacodynamics were not different from those of adults following the proposed dosing table. In addition, there was no significant effect of gender, ethnic, and age on omalizumab pharmacokinetics according to the population PK modeling results.

The sponsor proposed the labeling update related to omalizumab pharmacokinetics (Section 12.3) based on the modeling results as follows (red underlined text indicates addition.):

(b) (4)

Advisory meeting was held on November 18, 2009, and details can be found in clinical review as well as the Advisory Committee Meeting website (http://www.fda.gov/AdvisoryCommittees/Calendar/ucm183968.htm).

2 Question-Based Review (QBR)

2.1 General clinical pharmacology

2.1.1 *What are the pharmacokinetics of Xolair known in adults?*

According to the approved label, an average absolute bioavailability was 62%, tmax was an average of 7-8 days, accumulation was about 6-fold by AUC, apparent volume of distribution was 78mL/kg, and an average elimination half-life was 26 days, and apparent clearance was 2.4mL/kg/day. Omalizumab was linear at doses greater than 0.5 mg/kg.

Omalizumab clearance was known to involve IgG clearance such as the liver elimination through the reticuloendothelial system, and IgG-omalizumab complex clearance such as receptor mediated elimination.

2.1.2 *What are the characteristics of the exposure-response relationships?*

The followings summary on exposure-response should be interpreted with a limitation because the sponsor's exposure-response characterization was based on IgE and its clinical relevance has not been well established.

Omalizumab and IgE (free and total) concentrations were collected from the pivotal pediatric study and previously conducted studies (Tables 1 and 2). Clinical data such as total symptom score (TSS), peak expiratory flow (PEF), rescue medication use (RESC), forced expiratory flow in one second (FEV1), and exacerbations were collected from the above mentioned studies. Descriptive statistics on the observed omalizumab and IgE concentrations are summarized in Figure 1 and Table 3.

Table 1 Summary of studies contributed data for the PK/PD modeling

Study	Age	Design	PK/PD Samplings
IA05 (pivotal efficacy study)	6-12 yrs	1 yr, moderate-severe allergic asthma	6 samplings for total omalizumab (trough concentrations), free IgE, and total IgE
010 (n=334)	6-12 yrs	7 months with a 5 months extension, allergic asthma	baseline sampling, 5 samplings during the treatments, and 1 sample during the follow-up; 4 samples after the first dose and the last dose in 33 patients
008/009 (n=526/546)	12-76	7 months with 5 months extension, moderate to severe allergic asthma	trough concentration samplings at steady-state
011 (n=341)	12-75	32 weeks, severe allergic asthma	samplings for total IgE at Visits 7 and 13/14
2204 (n=155)	Healthy but atopic adult	single dose BE study	extensive samplings

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Table 2 Summary of samples and demographic data for the PK/PD modeling

Study	Active or placebo	Patient Numbers		# of samples analyzed	Demographic data Subjects used for analysis, mean ± SD (range)		
		Treated	Used in analysis		Age [years]	Bodyweight [kg]	Baseline IgE [ng/mL]
10	**A**	**225**	**225**	**2056**	**9 ± 2 (5-12)**	**39 ± 13 (20-79)**	**841 ± 645 (48-3071)**
	P/A*	**109**	**108**		**9 ± 2 (6-12)**	**39 ± 14 (20-78)**	**788 ± 662 (70-2933)**
IA05	**A**	**421**	**373**	**2693**	**9 ± 2 (6-11)**	**34 ± 11 (**19-92)**	**1155 ± 846 (65-3318)**
	P	**207**	**181**		**8 ± 2 (6-11)**	**34 ± 12 (20-78)**	**1116 ± 795 (70-3327)**
8	A	268	268	3129	39 ± 13 (12–73)	80 ± 20 (39–150)	417 ± 341 (48–2081)
	P	257	257		39 ± 14 (12–74)	78 ± 19 (39–136)	451 ± 345 (51–1699)
9	A	274	271	2632	40 ± 15 (12–76)	77 ± 17 (46–136)	541 ± 411 (51–1900)
	P	272	266		39 ± 14 (12–72)	78 ± 18 (40–148)	501 ± 391 (53-1970)
11	A	176	144	885	44 ± 14 (12–73)	76 ± 18 (41–135)	578 ± 461 (63–2553)
	P	165	130		43 ± 14 (12–74)	74 ± 14 (41–115)	613 ± 450 (46–1902)
2204		155	152	3847	35 ± 12 (18–64)	71 ± 12 (48–91)	186 ± 124 (47–620)

* "Placebo" subjects in study 10 received placebo in part I of the study and drug in part II of the study (after 7 months). The drug concentrations from these subjects from the active phase were included in the PK-PD analysis.

** One 19.3 kg subject was included in the study. The weight was rounded up to 20 kg to determine the dose from the dosing table

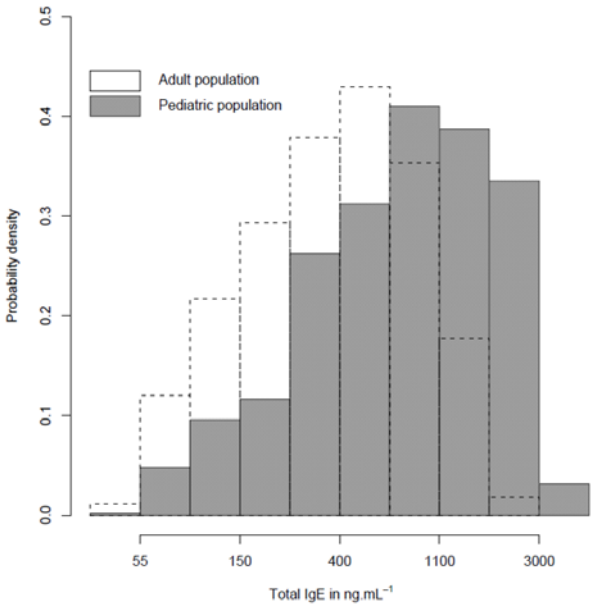


Figure 1 Baseline total IgE concentration by groups (pediatric vs. adult)

Table 3 Omalizumab trough concentrations and IgE concentrations at steady-state following the treatments in pediatric and adult patients

IgE at baseline	Statistic	Omalizumab (μg/mL)		Total IgE (ng/mL)		Free IgE (ng/mL)	
		Pediatric	Adult	Pediatric	Adult	Pediatric	Adult
30-200 IU/mL	№ patients	191	379	191	374	190	380
	5th	15.5	11.3	325	316	3.97	4
	Median	41.6	30.3	1111	963	12.3	12.8
	95th	85.5	76.1	2628	2166	35.0	34.4
	99th	122	96.2	3438	2872	50.3	54.2
200-500 IU/mL	№ patients	205	220	201	217	203	220
	5th	32.3	34.8	1095	1102	6.68	7.08
	Median	77.4	73.0	2521	2498	14.3	14.6
	95th	167	163	4810	4263	37	31.52
	99th	220	203	6587	5834	62.2	46.6
500-700 IU/mL	№ patients	65	40	65	38	65	41
	5th	57.0	47.7	1832	1115	7.40	8.24
	Median	135	117	3883	3446	16	15.4
	95th	218	186	6844	5496	39.8	32.8
	99th	307	205	8820	6000	51.4	57.6
More than 700 IU/mL	№ patients	118	8	119	8	119	8
	5th	96.1	84.7	2380	2886	7.61	10.3
	Median	185	163	4060	5965	14.0	21.5
	95th	318	305	7423	8087	26.8	30.9
	99th	374	305	9383	8087	33.5	30.9

*: total IgE was measured at the baseline. Patients with IgE levels greater than 700 IU/mL were included in the clinical tirals.

Dose and dosing frequency for pediatrics was determined by serum total IgE level (IU/mL) and body weight (kg) (Table 4). Dose should be adjusted if body weight is changed significantly. Re-testing of IgE levels during Xolair treatment cannot be used as a guide for dose determination because total IgE levels are elevated according to the approved label. The proposed pediatric dosing table is similar to that of the approved adult and adolescents (Table 5). However, the pediatric dosing table used in Study IA05 (Table 4) differed from the adult table as follows:

- The lowest body weight dosed; 20 kg in pediatrics vs. 30 kg adults and adolescents
- Dose adjustment; 4 brackets in pediatrics (every 5 kg in the 20 to 30 kg range, every 10 kg in the 30-90 kg range, 90-125 kg range, and 125-150 kg range) vs. for every 30 kg for adults and adolescents
- Dosing limit with the baseline IgE: 1300 IU/mL in pediatrics vs. 700 IU/mL in adults and adolescents.

Table 4 **Dosing table for the pediatric patients (6 - < 12 years)**

DOSING INTERVAL	BASELINE IGE (IU/ML)	BODY WEIGHT (KG)									
		20-25	>25-30	>30-40	>40-50	>50-60	>60-70	>70-80	>80-90	>90-125	>125-150
Q4wks	≥30–100	75	75	75	150	150	150	150	150	300	300
	>100–200	150	150	150	300	300	300	300	300	225	300
	>200–300	150	150	225	300	300	225	225	225	300	375
	>300–400	225	225	300	225	225	225	300	300		
	>400–500	225	300	225	225	300	300	375	375		
	>500–600	300	300	225	300	300	375				
	>600–700	300	225	225	300	375					
Q2wks	>700–800	225	225	300	375						
	>800–900	225	225	300	375						
	>900–1000	225	300	375							
	>1000–1100	225	300	375							
	>1100–1200	300	300								
	>1200–1300	300	375								

Do not dose in this area

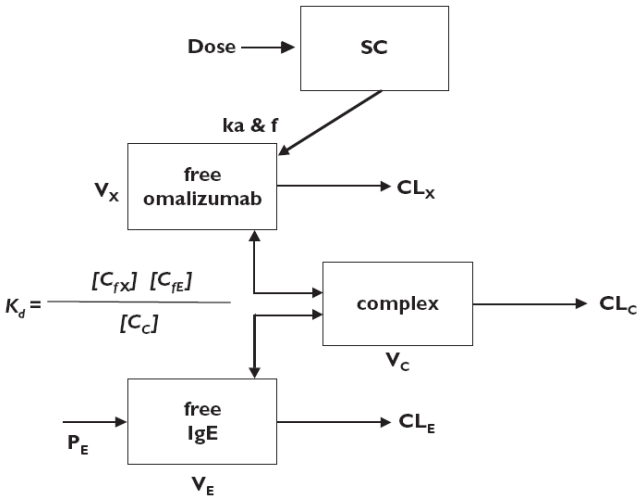
Table 5 **Dosing table for adults and adolescences patients**

DOSING INTERVAL	Pre-treatment Serum IgE (IU/mL)	Body Weight (kg)			
		30–60	> 60–70	> 70–90	> 90–150
Q4wks	≥ 30–100	150	150	150	300
	> 100–200	300	300	300	225
	> 200–300	300	225	225	300
Q2wks	> 300–400	225	225	300	
	> 400–500	300	300	375	
	> 500–600	300	375		
	>600-700	375			

The sponsor modeled data using NONMEM® (VI with ADVAN 6) based on the nonlinear mixed-effect model of omalizumab-IgE turnover and binding (Hayashi *et al*, Brit J Clin Pharmacol 2006;63:548-561, Figure 2) with a few additional steps to the approach of Hayashi *et al* as follows:

- Kd was not fixed
- Baseline IgE was a covariate on Kd
- Bodyweight was an additional covariate to IgE production and clearance

NONMEM code is in the Attachment.



$$\frac{dS}{dt} = -k_a S$$

$$\frac{dX_T}{dt} = k_a S - \frac{CL_X X}{V_X} - \frac{CL_C C}{V_C}$$

$$\frac{dE_T}{dt} = R_E - \frac{CL_E E}{V_E} - \frac{CL_C C}{V_C}$$

$$C = \left(\frac{K_d V_X V_E}{V_C} + X_T + E_T \right) - \sqrt{\left(\frac{K_d V_X V_E}{V_C} + X_T + E_T \right)^2 - 4 X_T E_T} \Big/ 2$$

$$X = X_T - C$$

$$E = E_T - C$$

$$Kd = Kd_0 \left(\frac{X_T}{E_T} \right)^{\alpha}$$

Figure 2 Schematic summary of pharmacokinetic and pharmacodynamic modeling and corresponding equations to describe the processes (reference: Hayashi et al.)

where,

k_a: absorption rate constant (1/h)
f: absolute bioavailability
D: dose (nmol)
P_E: endogenous production rate of IgE (nmol/h)
CL_X: clearance of free omalizumab (ml/h)
CL_E: clearance of free IgE (ml/h)
CL_C; clearance of complex (ml/h)
V_X; distribution volume of free omalizumab (ml)
V_E: distribution volume of free omalizumab (ml)

V_C: distribution volume of complex (ml)
K_d; dissociation constant

The estimated model parameters are summarized Table 6. The model characterized the pooled data well indicated by the diagnostic plots (Figure 3), good individual predicted curves (Figure 4), and no apparent patterns in the relationship between the ETAs for the model parameters and covariates (Figure 5). Standard errors of the population means (SEM) were within reasonabe range. In addition, estimated trough concentration of omalizumab, total and free IgE (Table 7) were comparable to those of observed data (Table 3).

Table 6Estimated parameters for the population omalizumab-IgE model

Omalizumab or IgE parameter [units]	Population mean [$\theta \pm$ SEM]	Inter-individual variance [(%CV) $\omega \pm$ SEM]
CL_X/F [$L \cdot .d^{-1}$]*	0.196 ± 0.00284	(29%) 0.0858 ± 0.00519
CL_E/F [$L \cdot d^{-1}$]**	2.68 ± 0.387	(17%) 0.0298 ± 0.0188
CL_C/F [$L \cdot d^{-1}$]*	0.613 ± 0.0857	(17%) 0.0295 ± 0.0142
V_X/F & V_E/F [L]*	8.07 ± 0.192	(20%) 0.0383 ± 0.00446
V_C/F [L]*	2.13 ± 0.42	(124%) 1.54 ± 0.473
R_E/F [$\mu g \cdot d^{-1}$]**	857 ± 122	(25%) 0.065 ± 0.0177
k_a [d^{-1}]	0.632 ± 0.151	(107%) 1.14 ± 0.421
K_d [nM]	1.84 ± 0.0707	(23%) 0.055 ± 0.00617
α	0.0921 ± 0.00814	
Covariates (allometric exponents)		
Baseline IgE on R_E/F	0.637 ± 0.0146	
Baseline IgE on CL_E/F	0.345 ± 0.0137	
Baseline IgE on Kd	0.122 ± 0.0108	
Bodyweight on CL_X/F	0.851 ± 0.0243	
Bodyweight on CL_E/F	1.51 ± 0.29	
Bodyweight on CL_C/F	1.53 ± 0.289	
Bodyweight on V_X/F	1.04 ± 0.0404	
Bodyweight on V_C/F	1.25 ± 0.223	
Bodyweight on R_E/F	1.59 ± 0.296	
Covariance $\eta_{CLX/F}$:$\eta_{VX/F}$	0.0448 ± 0.00416	
Covariance $\eta_{CLC/F}$:$\eta_{RE/F}$	-0.0198 ± 0.0156	
Residual variance (%CV), $\sigma \pm$ SEM		
Omalizumab	(25%) 0.0601 ± 0.00422	
Total IgE	(29%) 0.0822 ± 0.00459	
Free IgE	(30%) 0.0892 ± 0.00492	
Objective function	-30879.338	

*Value at 70 kg bodyweight

**Value at 70 kg and 365 ng/mL of baseline IgE

For convenience inter- and intra-individual variances are shown as %CV ($100*\sqrt{\omega}$) as well as the original values determined by NONMEM.

Source: CIGE025A/pool/pkpd_001/nonmem/R167/ M167EST.nmlog

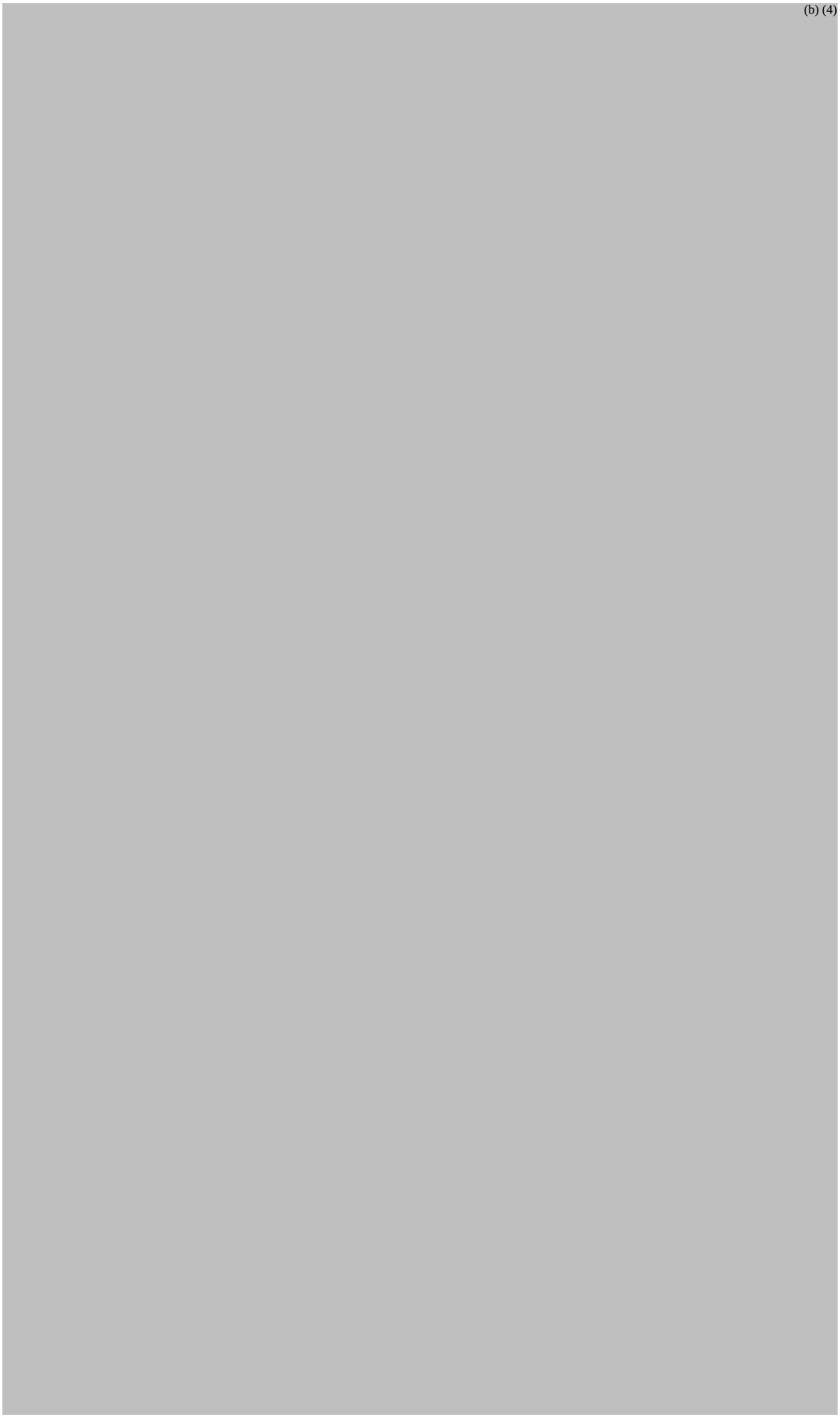

(b) (4)

Figure 5 **Relationship between ETA values for the model parameters and age**

Table 7 **Estimated trough concentrations of omalizumab, total and free IgE in pediatric and adult patients**

IgE at baseline	Statistic	Omalizumab (µg/mL)		Total IgE (ng/mL)		Free IgE (ng/mL)	
		Pediatric	Adult	Pediatric	Adult	Pediatric	Adult
30-200 IU/mL	№ patients	191	379	191	374	190	380
	5th	17.4	13.1	393	331	4.96	4.63
	Median	44.1	30.5	1058	940	11.9	12.8
	95th	80.7	68.6	2162	1875	27.2	28.8
	99th	98.9	86	2660	2337	36.5	49
200-500 IU/mL	№ patients	205	220	201	217	203	220
	5th	35.1	39.7	1120	1211	7.73	8.22
	Median	79.7	73.3	2322	2342	14.5	14.7
	95th	146	137	4303	3744	28.7	28.9
	99th	178	167	4638	5090	43.1	38.3
500-700 IU/mL	№ patients	65	40	65	38	65	41
	5th	64	58.5	1919	1495	7.82	11.2
	Median	130	112	3447	3217	15.2	15.2
	95th	201	156	6063	4803	32.1	29.6
	99th	278	163	6496	5449	39.1	33.3
More than 700 IU/mL	№ patients	118	8	119	8	119	8
	5th	116	73.8	2723	3585	7.38	13.7
	Median	184	158	4056	5517	12.8	20.3
	95th	303	254	6790	6664	21.7	26.3
	99th	339	254	7203	6664	26.8	26.3

Once the final parameters were estimated, a predictive check was performed to test the ability of the model to predict the free IgE. Data set was replicated 10 times and free IgE concentrations 6 months after dosing simulate. Simulated data was overlaid with the observed data using a histogram for 9 subsets based on 3 subgroups based on IgE values and 3 subgroups based on bodyweights (Figure 6).

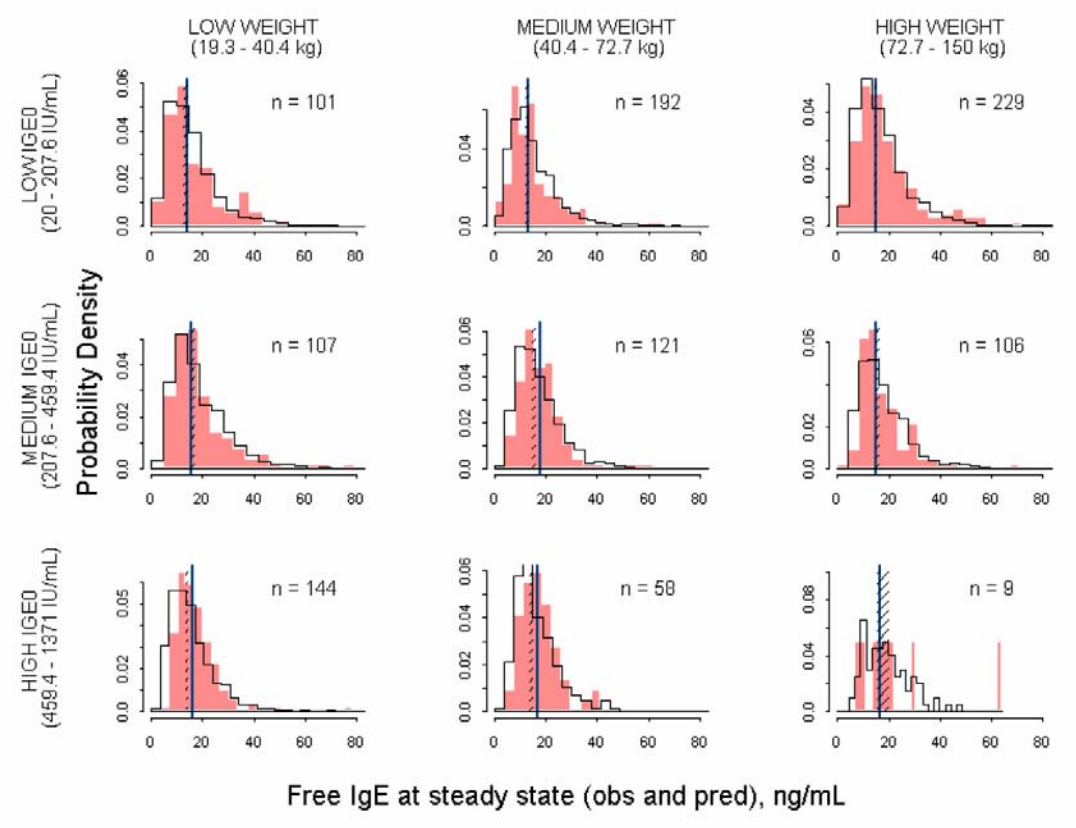
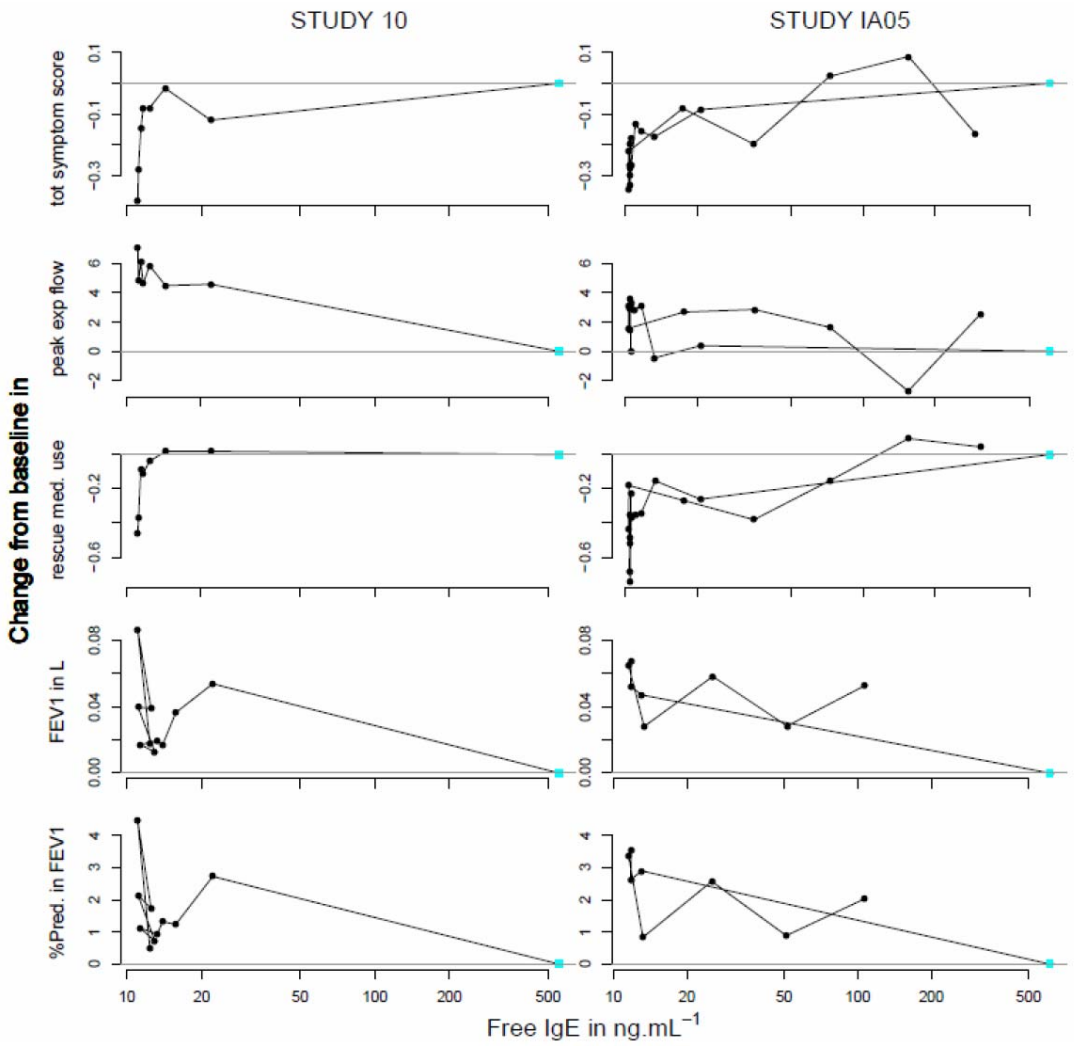


Figure 6 **Predictive check of the model on to the distribution of free IgE (solid histogram – observed data, open histrgrams – simulated data, lines – median from the simulation, cross-hatched areas – 95% confidence interval for the median)**

The sponsor attempted a correlation between free IgE and clinical outcomes such as total asthma symptoms score, mean morning peak expiratory flow and rescue medication use (mean number of daily puffs). There was no proposed mechanism or causality in the correlation. The changes from the baseline were summarized into 28-day arithmetic means. Model-derived midpoint free IgE was correlated to the clinical outcomes (Figure 7). In addition, free IgE at the same time points was correlated with forced expiratory volume in one second (FEV1) and percent predicted FEV1 (a percent of predicted FEV1 using the Polgars standard calculation). There was non-linear relationship between free IgE concentrations and clinical parameters with a lag time (Figure 7).



Source: [Xolair PKPD Clinical Symptoms M&S Report, Figure 10-21]

Figure 7 Model-derived concentrations of free IgE at the midpoint of each of 4 week block of time vs. the mean clinical measurments for the corresponding periods

Overall, the sponsor concluded the followings from the modeling and simulation:

- The proposed PK/PD model allowed the estimation of omalizumab, total IgE, and free IgE concentration following the proposed dosing.
- The model fitted data well and simulated well the pharmacodynamic changes.
- Pediatric omalizumab pharmacokinetic and pharmacodynamics parameters were comparable to those of adult and adolescent patients including the suppression of free IgE
- Free IgE concentrations correlated with clinical measure of asthma.

2.1.3 *Were the bioanalytical studies acceptable?*

Total omalizumab (free omalizumab+omalizumab bound to IgE) and free IgE in serum were analyzed using ELISA. Total IgE in serum was analyzed using a commercial microbead enzyme immunoassay test kit manufactured by Abbott Inc., USA. Lower limit of quantification was 16 ng/mL, 0.78 ng/mL, and 9.6 ng/mL for total omalizumab, free IgE, and total IgE, respectively. The omalizumab assay used human serum samples diluted 1:100 and the assay range was 0.156 ng/mL to 10 ng/mL. The bioanalytical reports on QC samples were acceptable with reasonable bias and precision (CV%) (Table 8). Bioanalytical study sites were Novartis Pharma AG, Basel, Switzerland for total omalizumab and free IgE, and [redacted] (b) (4) for total IgE. The bioanalytical methods (Report 94-01-1560-571) seem to be the same as one for previously conducted clinical trials.

Table 8 QC sample results total omalizumab and free IgE (NBXRCIGE025AIA05)

total omalizumab

		Nominal Total IGE025 concentrations (ng/mL)					
PlateNo.	Date	0.4	1	8	40000[a]	40000[b]	40000[c]
		Measured Total IGE025 concentrations (ng/mL)					
E25-P151	22-Apr-08	[redacted] (b) (4)					
E25-P152	22-Apr-08						
E25-P153	7-May-08						
E25-P154	7-May-08						
E25-P155	14-May-08						
E25-P156	14-May-08						
E25-P157	15-May-08						
E25-P158	15-May-08						
E25-P159	15-May-08						
E25-P160	28-May-08						
Mean		0.374	1.095	7.86	36267	38121	41169
SD		0.034	0.084	0.57	4283	2427	14813
CV%		9.0	7.6	7.3	11.8	6.4	36.0
Bias%		-6.5	9.5	-1.8	-9.3	-4.7	2.9
n		160	160	160	160	160	160

[a]: after 1:5000 dilution

[b]: after 1:10000 dilution until 02-Aug-2007, then dilution was adjusted to 1:40000 to better match sample dilutions

[c]: after 1:100000 dilution

Bold: out of acceptance criteria. Values included in the statistics since the runs were accepted.

Free IgE (period 1)

		Nominal Free IgE concentrations (ng/mL)			
Plate No.	Date	2.046	22.077	51.321	15.582
		Measured Free IgE concentrations (ng/mL)			
IgE-P55	27-Jul-07	(b) (4)			
IgE-P56	27-Jul-07				
IgE-P57	3-Aug-07				
Mean		2.164	20.745	50.958	16.444
SD		0.152	1.853	3.531	2.257
CV%		7.0	8.9	6.9	13.7
Bias%		5.8	-6.0	-0.7	5.5
n		57	57	57	57

Free IgE (period 2)

		Nominal Free IgE concentrations (ng/mL)			
Plate No.	Date	2.364	10.171	61.818	20.562
		Measured Free IgE concentrations (ng/mL)			
IgE-P103	6-Jun-08	(b) (4)			
IgE-P103	6-Jun-08				
IgE-P104	6-Jun-08				
IgE-P104	6-Jun-08				
IgE-P105	9-Jun-08				
IgE-P105	9-Jun-08				
IgE-P106	9-Jun-08				
IgE-P106	9-Jun-08				
IgE-P107	9-Jun-08				
IgE-P107	9-Jun-08				
IgE-P108	9-Jun-08				
IgE-P108	9-Jun-08				
IgE-P109	9-Jun-08				
IgE-P109	9-Jun-08				
IgE-P110	11-Jun-08				
IgE-P110	11-Jun-08				
IgE-P111	11-Jun-08				
IgE-P111	11-Jun-08				
IgE-P112	11-Jun-08				
IgE-P112	11-Jun-08				
Mean		2.584	9.757	61.748	20.309
SD		0.218	0.690	7.270	2.046
CV%		8.4	7.1	11.8	10.1
Bias%		9.3	-4.1	-0.1	-1.2
n		96	96	96	96

Bold: out of acceptance criteria. Values included in the statistics since the runs were accepted.

Total IgE for assay 1-12

QC name	target range total IgE [IU/ml]	n	mean measured total IgE [IU/ml]	Precision [%]
QC-L	1.22 – 2.26	12	1.79	4.7
QC-M	63.9 - 95.4	12	80.6	5.8
QC-H	790- 1184	12	1005	7.5

13-29

QC name	target range total IgE [IU/ml]	n	mean measured total IgE [IU/ml]	Precision [%]
QC-L	1.07 - 1.98	17	1.64	4.6
QC-M	58.4 - 87.6	17	74.2	7.1
QC-H	846 - 1268	17	1088	9.2

31-50

QC name	target range total IgE [IU/ml]	n	mean measured total IgE [IU/ml]	Precision [%]
QC-L	1.04 - 1.93	19	1.48	4.3
QC-M	54.3 - 81.4	20	69.2	5.8
QC-H	792 - 1188	20	1008	6.0

51-106

QC name	target range total IgE [IU/ml]	n	mean measured total IgE [IU/ml]	Precision [%]
QC-L	1.14 – 2.12	53	1.55	5.0
QC-M	60.5 - 90.7	53	71.7	5.8
QC-H	754 - 1131	53	967	6.0

107-099

QC name	target range total IgE [IU/ml]	n	mean measured total IgE [IU/ml]	Precision [%]
QC-L	0.89 - 1.65	80	1.44	4.9
QC-M	57.7 - 86.5	80	68.4	5.6
QC-H	804 - 1206	80	901	6.6

Signature:

Sang Chung: _____
Reviewer

Partha Roy: _____
Team Leader (Acting)