

# AIRBORNE FUNGAL SPORES AND HYPERSENSITIVITY TO MOULDS IN CATALONIA

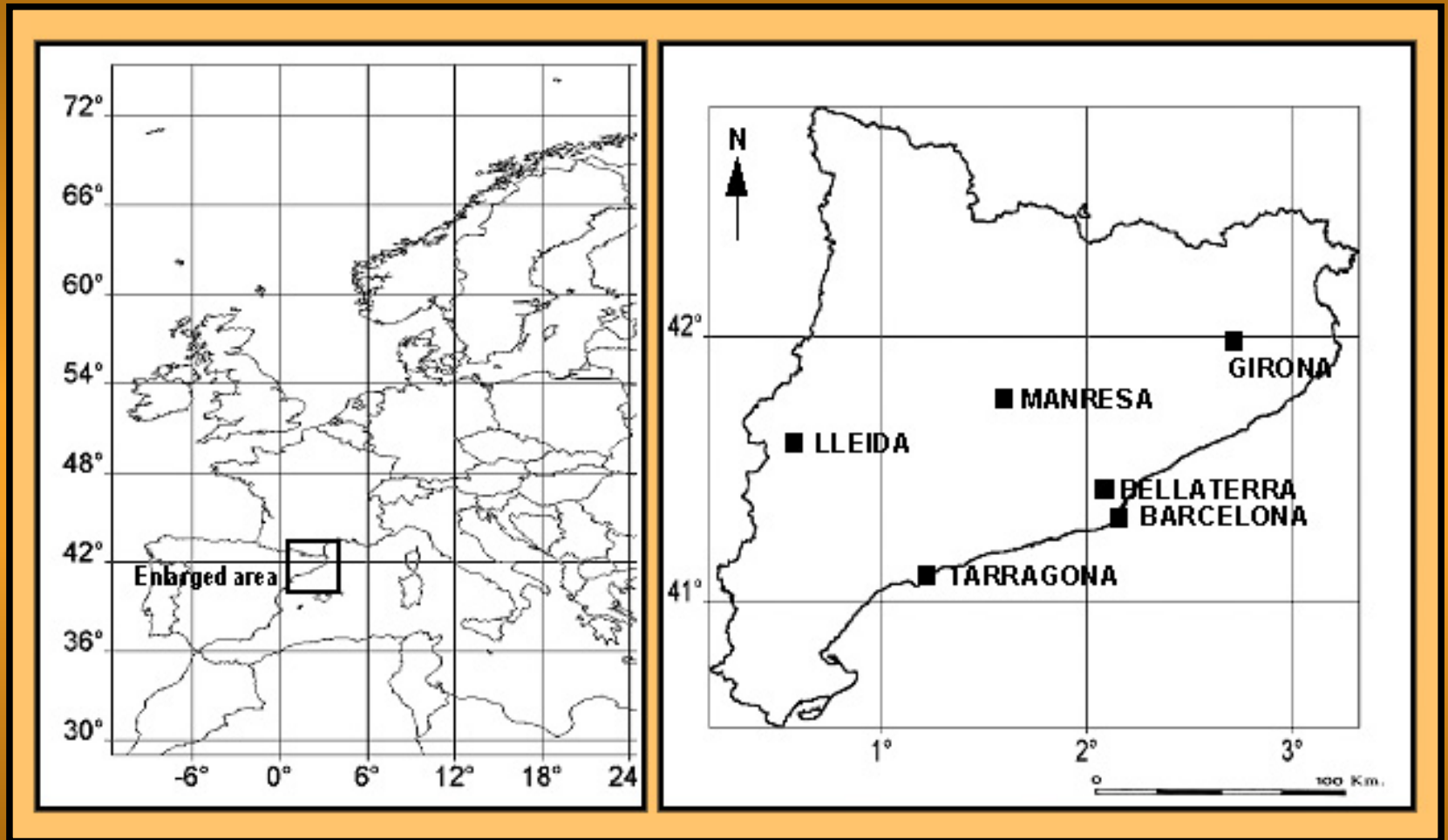
Belmonte J.<sup>1</sup>, J. Bartra<sup>2</sup>, J. & J.M. Torres-Rodríguez<sup>3</sup>

<sup>1</sup>Botany Unit, Autonomous University of Barcelona, Spain

<sup>2</sup>Allergy Unit, Universitarian Hospital Josep Trueta, Girona, Spain

<sup>3</sup>GREMEC-IMAS, Autonomous University of Barcelona, Spain

# The territory under study



# Sampling sites and local climate



**Montebello,  
August 2002**

Aerobiological Sampling Stations	Geographical characteristics		Climatic characteristics		
	Altitude (m.a.s.l.)	Geographical Coordinates	Mean Annual Temperature (°C)	Annual Rainfall (mm)	Phytoclimates (Allue,1990)
Barcelona	12	41°24' N, 02°11' E	16.4	593	Fresh-Tethyc-semiarid
Bellaterra	190	41°33' N, 02°07' E	15.2	594	Fresh-Continental Oriental-semihumid
Girona	70	41°59' N, 02°60' E	15.0	740	Fresh-Continental Oriental-semihumid
Lleida	221	41°37' N, 00°37' E	15.1	385	Fresh-Transitional-semiarid
Manresa	238	41°43' N, 01°50' E	13.6	619	Fresh-Continental Oriental-semihumid
Tarragona	20	41°07' N, 01°15' E	15.8	478	Fresh-Tethyc-semiarid

# Aerobiological material and methods

Montebello,  
August 2002

## 6 sampling stations

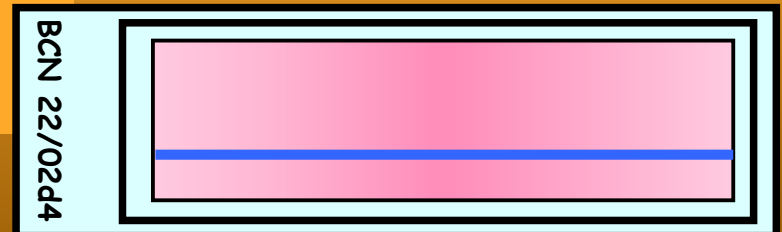


## Hirst samplers Burkard and Lanzoni



## Daily spore counts

1 longitudinal line (600X) per day



# Allergenic spores

# spectra

Montebello,  
August 2002



LLEIDA	TARRAGONA	BARCELONA	BELLATERRA	MANRESA	GIRONA
<i>Cladosporium</i>	<i>Cladosporium</i>	<i>Cladosporium</i>	<i>Cladosporium</i>	<i>Cladosporium</i>	<i>Cladosporium</i>
<i>Alternaria</i>	COPRINACEAE	<i>Alternaria</i>	COPRINACEAE	COPRINACEAE	COPRINACEAE
COPRINACEAE	<i>Alternaria</i>	COPRINACEAE	<i>Alternaria</i>	<i>Alternaria</i>	<i>Leptosphaeria</i>
<i>Ustilago</i>	<i>Ustilago</i>	<i>Ustilago</i>	<i>Agaricus</i>	<b>Asp.-Penicillium</b>	<i>Alternaria</i>
<i>Arthrinium</i>	<b>Asp.-Penicillium</b>	<i>Agaricus</i>	<i>Leptosphaeria</i>	<i>Ustilago</i>	<i>Arthrinium</i>
<i>Epicoccum</i>	<i>Drechs.Helminthos.</i>	<b>Asp.-Penicillium</b>	<i>Ustilago</i>	<i>Leptosphaeria</i>	<i>Ustilago</i>
<i>Leptosphaeria</i>	<i>Leptosphaeria</i>	<i>Leptosphaeria</i>	<b>Asp.-Penicillium</b>	<i>Drechs.Helminthos.</i>	<b>Asp.-Penicillium</b>
<i>Drechs.Helminthos.</i>	<i>Agaricus</i>	<i>Arthrinium</i>	<i>Ganoderma</i>	<i>Agaricus</i>	<i>Epicoccum</i>
<i>Torula</i>	<i>Arthrinium</i>	<i>Drechs.Helminthos.</i>	<i>Arthrinium</i>	<i>Arthrinium</i>	<i>Ganoderma</i>
<b>Asp.-Penicillium</b>	<i>Torula</i>	<i>Ganoderma</i>	<i>Drechs.Helminthos.</i>	<i>Epicoccum</i>	<i>Periconia</i>
<i>Periconia</i>	<i>Periconia</i>	<i>Epicoccum</i>	<i>Epicoccum</i>	XYLARIACEAE	XYLARIACEAE
<i>Stemphylium</i>	<i>Stemphylium</i>	<i>Periconia</i>	<i>Stemphylium</i>	<i>Stemphylium</i>	<i>Drechs.Helminthos.</i>
XYLARIACEAE	<i>Epicoccum</i>	<i>Stemphylium</i>	<i>Periconia</i>	<i>Torula</i>	<i>Stemphylium</i>
<i>Ganoderma</i>	XYLARIACEAE	<i>Torula</i>	<i>Torula</i>	<i>Ganoderma</i>	<i>Agaricus</i>
<i>Chaetomium</i>	<i>Ganoderma</i>	<i>Puccinia</i>	<i>Puccinia</i>	<i>Periconia</i>	<i>Torula</i>
<i>Agaricus</i>	<i>Puccinia</i>	XYLARIACEAE	XYLARIACEAE	<i>Nigrospora</i>	<i>Chaetomium</i>
<i>Nigrospora</i>	<i>Chaetomium</i>	<i>Chaetomium</i>	<i>Chaetomium</i>	<i>Chaetomium</i>	<i>Puccinia</i>
<i>Polythrincium</i>	<i>Nigrospora</i>	<i>Nigrospora</i>	<i>Nigrospora</i>	<i>Puccinia</i>	<i>Tilletia</i>
<i>Puccinia</i>	<i>Tilletia</i>	<i>Polythrincium</i>	<i>Polythrincium</i>	<i>Tilletia</i>	<i>Polythrincium</i>
<i>Fusarium</i>	<i>Fusarium</i>	<i>Tilletia</i>	<i>Fusarium</i>	<i>Polythrincium</i>	<i>Fusarium</i>
<i>Tilletia</i>	<i>Polythrincium</i>	<i>Fusarium</i>	<i>Tilletia</i>	<i>Fusarium</i>	<i>Nigrospora</i>

# Conclusions

Montebello,  
August 2002

## Fungal spores spectrum in Catalonia, 1995-2001

### Alphabetical relation of allergenic spores:

*Agaricus*  
*Alternaria*  
*Arthrinium*  
*Aspergillus-Penicillium*  
*Chaetomium*  
*Cladosporium*  
COPRINACEAE  
*Drechslera-Helminthosporium*  
*Epicoccum*  
*Fusarium*  
*Ganoderma*  
*Leptosphaeria*  
*Nigrospora*  
*Periconia*  
*Polythrincium*  
*Puccinia*  
*Stemphylium*  
*Tilletia*  
*Torula*  
*Ustilago*  
XYLARIACEAE

### Rank of allergenic spores:

*Cladosporium*, COPRINACEAE, *Alternaria*, *Ustilago*  
*Asp-Penicill*, *Leptosphaeria*, *Arthrinium*, *Drechs-Helminth*, *Agaricus*...

### Rank of localities:

Manresa  
Girona  
Lleida  
Bellaterra  
Tarragona  
Barcelona

↓ +  
Total spores  
Allergenic spores  
Highest annual indexes  
↓ -

### Rank of localities following the diversity of taxa with highest annual indexes:

Girona  
Manresa - Lleida  
Bellaterra  
Tarragona - Barcelona

↓ +  
↓ -

# Catalan Survey on hypersensitivity to moulds

Collaboration undertaken in 2002 between the Aerobiological Network of Catalonia (Xarxa Aerobiològica de Catalunya, XAC) and the Catalan Society of Allergy and Clinical Immunology (Societat Catalana d'Al·lèrgia i Immunologia Clínica, SCAIC), with the economic support of **Laboratorios CBF-LETI, SA.**

# Catalan Survey on hypersensitivity to moulds

## Main Objectives

- To know the prevalence of sensitivity to the main mould antigens in patients with asthma or rhinitis, living in an specific geographic area.
- To relate with the atmospheric spore counts in the area.



# Catalan Survey on hypersensitivity to moulds

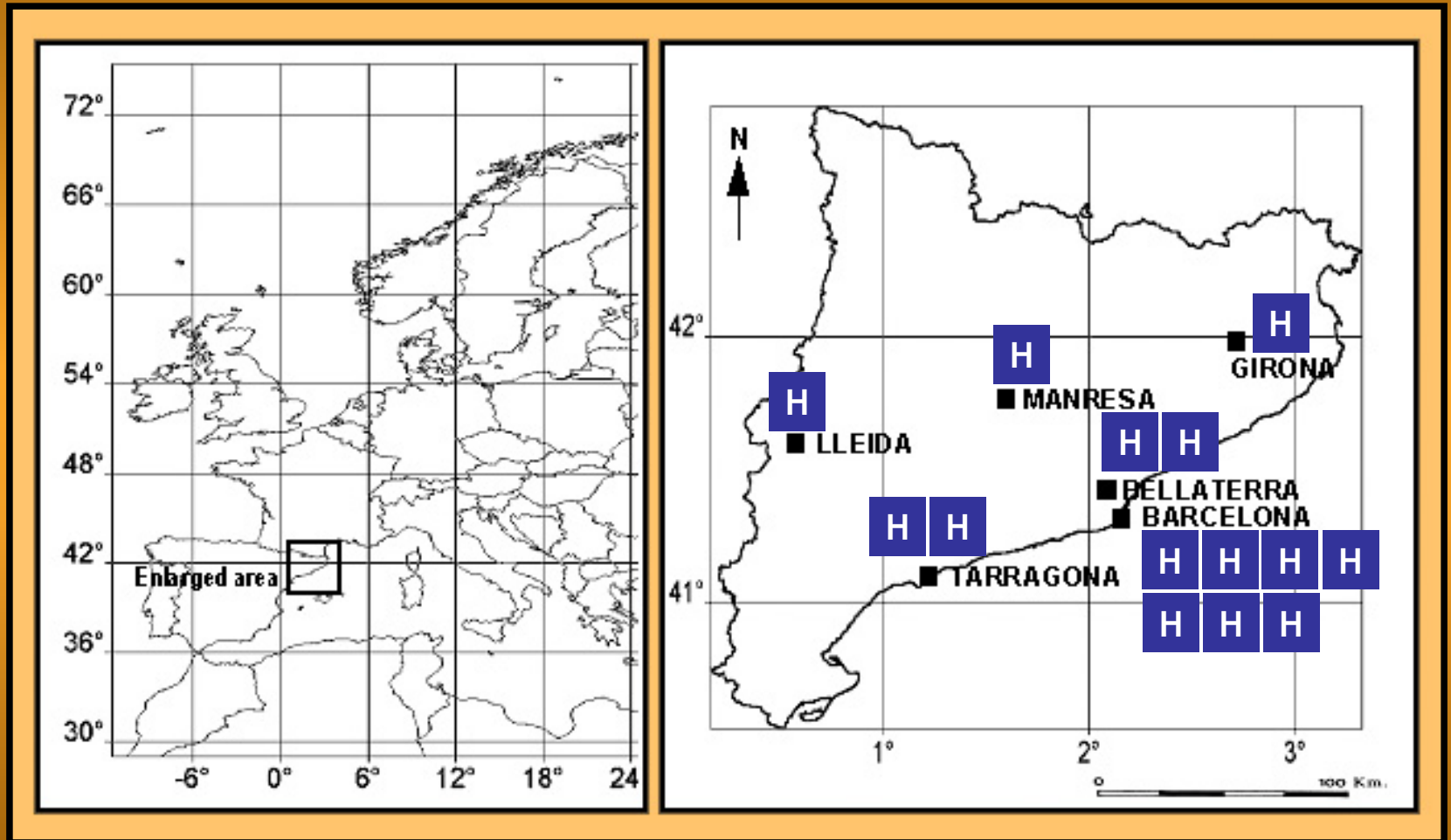
## Secondary Objectives

- To investigate if there are geographical differences in hypersensitivity distribution.
- To correlate the allergy with the habitat characteristics and with asthma development.
- To study the sensitivity of specific IgE to moulds with prick test.

# The territory under study

■ Aerobiological stations

H Allergy unit



## ■ Aerobiological stations

- Daily spore counts
- along 2002
- at the 6 XAC stations
- 1 longitudinal line per day
- Spore taxa:

*Alternaria*  
*Cladosporium*  
*Ustilago*  
*Aspergillus-Penicillium*

## H Allergy units

- Personal inquiry to patients
- along 2002
- at 14 Allergy Units
- Blood sample for IgE measurement
- Prick test with moulds battery:

*Alternaria alternata*  
*Cladosporium herbarum*  
*Ustilago*  
*Aspergillus fumigatus*  
*Penicillium notatum*

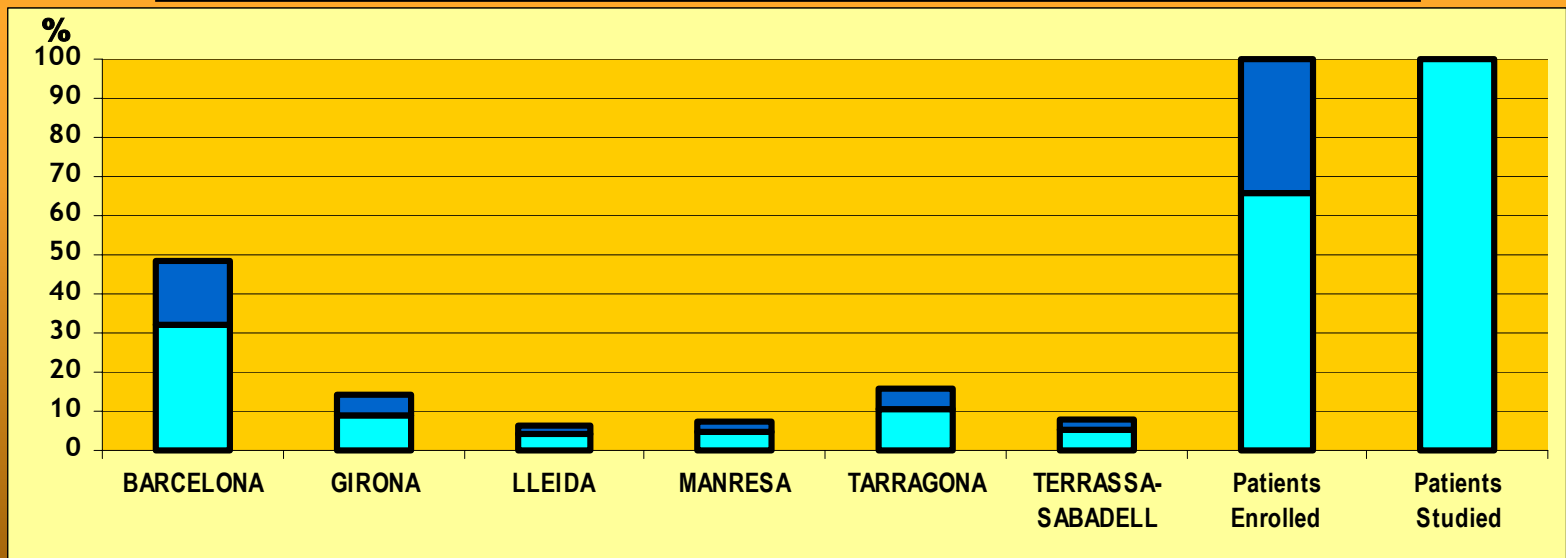
Patients enrolled: **824**

- papular area  $\geq 7 \text{ mm}^2$
- by duplicate
- using two different antigens
- blaine application

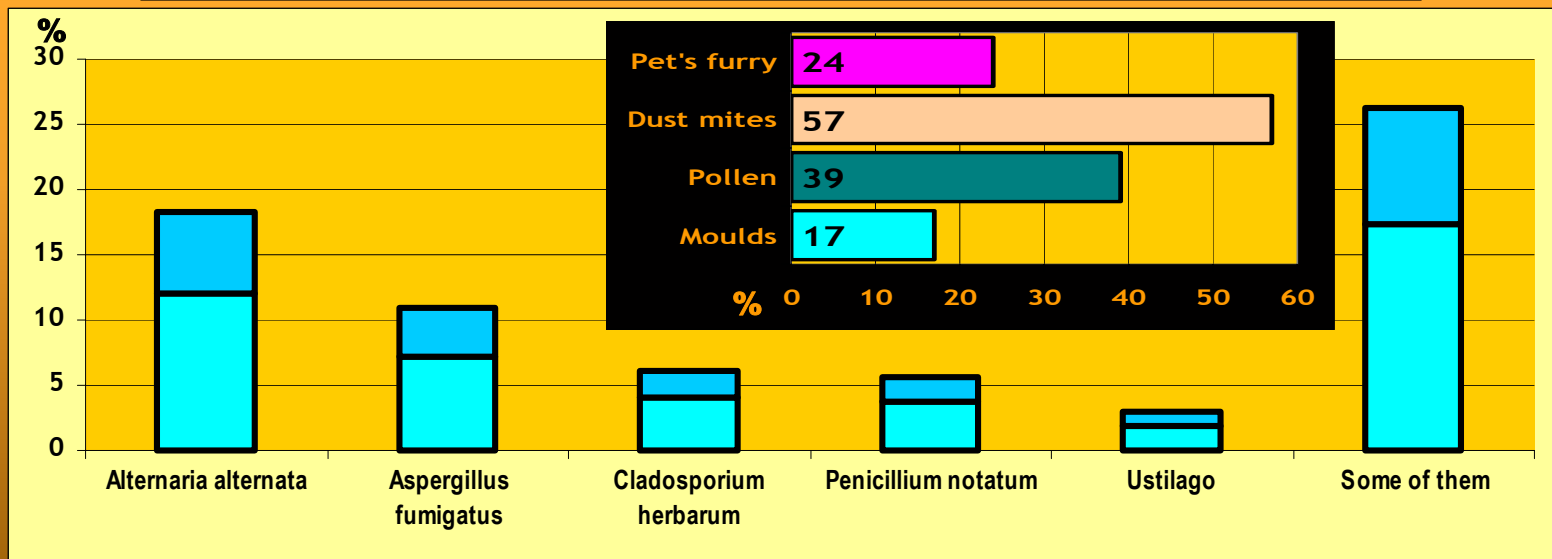
Patients studied: **1250**

- people with asthma or rhinitis visiting one of the Allergy units
- women and men
- 5-65 years old
- No previous immunotherapy

CLINICAL RESULTS 2002			
YEARLY DATA			
	Nr of Patients	% Total Patients Enrolled	% Total Patients Studied
BARCELONA	399	48,4	31,9
GIRONA	115	14,0	9,2
LLEIDA	52	6,3	4,2
MANRESA	60	7,3	4,8
TARRAGONA	132	16,0	10,6
TERRASSA-SABADELL	66	8,0	5,3
Total Patients Enrolled	824	100,0	65,9
Total Patients Studied	1250		100,0



CLINICAL RESULTS 2002			
YEARLY DATA			
	Nr of Patients	% Total Patients Enrolled	% Total Patients Studied
<i>Alternaria alternata</i>	151	18,3	12,1
<i>Aspergillus fumigatus</i>	90	10,9	7,2
<i>Cladosporium herbarum</i>	50	6,1	4,0
<i>Penicillium notatum</i>	47	5,7	3,8
<i>Ustilago</i>	24	2,9	1,9
Some of them	217	26,3	17,4



# Alternaria

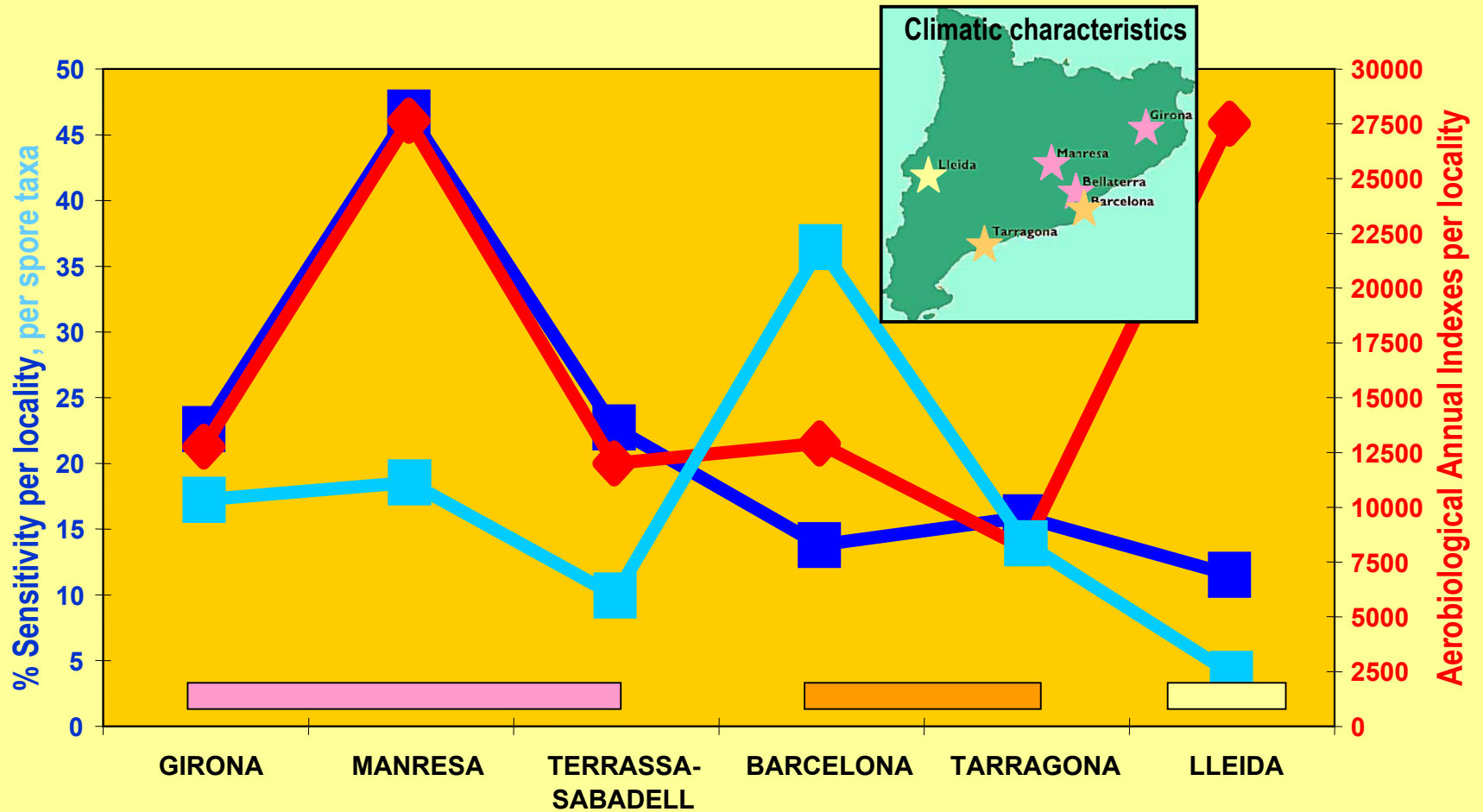
CLINICAL RESULTS 2002			
YEARLY DATA			
Nr of Patients	% Total Patients <i>Alternaria</i>	% Total Patients Studied	% Patients per Locality
BARCELONA	55	<b>1</b> 36,4	<b>1</b> 4,4 <b>5</b> 13,8
GIRONA	26	<b>3</b> 17,2	<b>3</b> 2,1 <b>3</b> 22,6
LLEIDA	6	<b>6</b> 4,0	<b>6</b> 0,5 <b>6</b> 11,5
MANRESA	28	<b>2</b> 18,5	<b>2</b> 2,2 <b>1</b> 46,7
TARRAGONA	21	<b>4</b> 13,9	<b>4</b> 1,7 <b>4</b> 15,9
TERRASSA-SABADELL	15	<b>5</b> 9,9	<b>5</b> 1,2 <b>2</b> 22,7
Total <i>Alternaria</i>	151	100,0	12,1 18,3

AEROBIOLOGICAL RESULTS 2002					
YEARLY DATA		WEEKLY DATA		DAILY DATA	
Annual Index	% Total Spores	Weekly maximum P/m <sup>3</sup> /week	Week Nr	Daily maximum P/m <sup>3</sup> /day	Date
<b>3</b> 12911	4,5	173,2	30	<b>4</b> 411,6	JL23
<b>4</b> 12762	1,3	278,8	29	<b>3</b> 434,0	JL21
<b>2</b> 27496	7,1	241,2	35	<b>1</b> 767,2	N3
<b>1</b> 27625	2,4	209,6	29	<b>2</b> 624,4	J6
<b>6</b> 8123	2,8	76,5	35	<b>6</b> 271,6	N3
<b>5</b> 11995	3,0	104,4	31	<b>5</b> 375,2	017



# Sensitivity to *Alternaria alternata* spores

## *Alternaria* Annual Indexes



	CLINICAL RESULTS 2002					CLINICAL RESULTS 2002						
	<b>Clinical level</b>					YEARLY DATA						
	Nr of Patients	Patients <i>Aspergillus</i>	Patients Studied	per Locality		Nr of Patients	% Total Patients <i>Penicillium</i>	% Total Patients Studied	% Patients per Locality			
<b>X2!!! Aspergillus</b>	BARCELONA	46	51.1	3.7	11.5	BARCELONA	25	53.2	2.0	6.3		
	GIRONA	12	13.3	1.0	4	10.4	GIRONA	4	8.5	0.3	5	3.5
	LLEIDA	6	6.7	0.5	2	11.5	LLEIDA	2	4.3	0.2	4	3.8
	MANRESA	9	10.0	0.7	1	15.0	MANRESA	2	4.3	0.2	6	3.3
	TARRAGONA	11	12.2	0.9	6	8.3	TARRAGONA	9	19.1	0.7	6.8	
	TERRASSA-SABADELL	6	6.7	0.5	9.1	TERRASSA-SABADELL	5	10.6	0.4	7.6		
	Total <i>Aspergillus</i>	90	100.0	7.2	10.9	Total <i>Penicillium</i>	47	100.0	3.8	5.7		

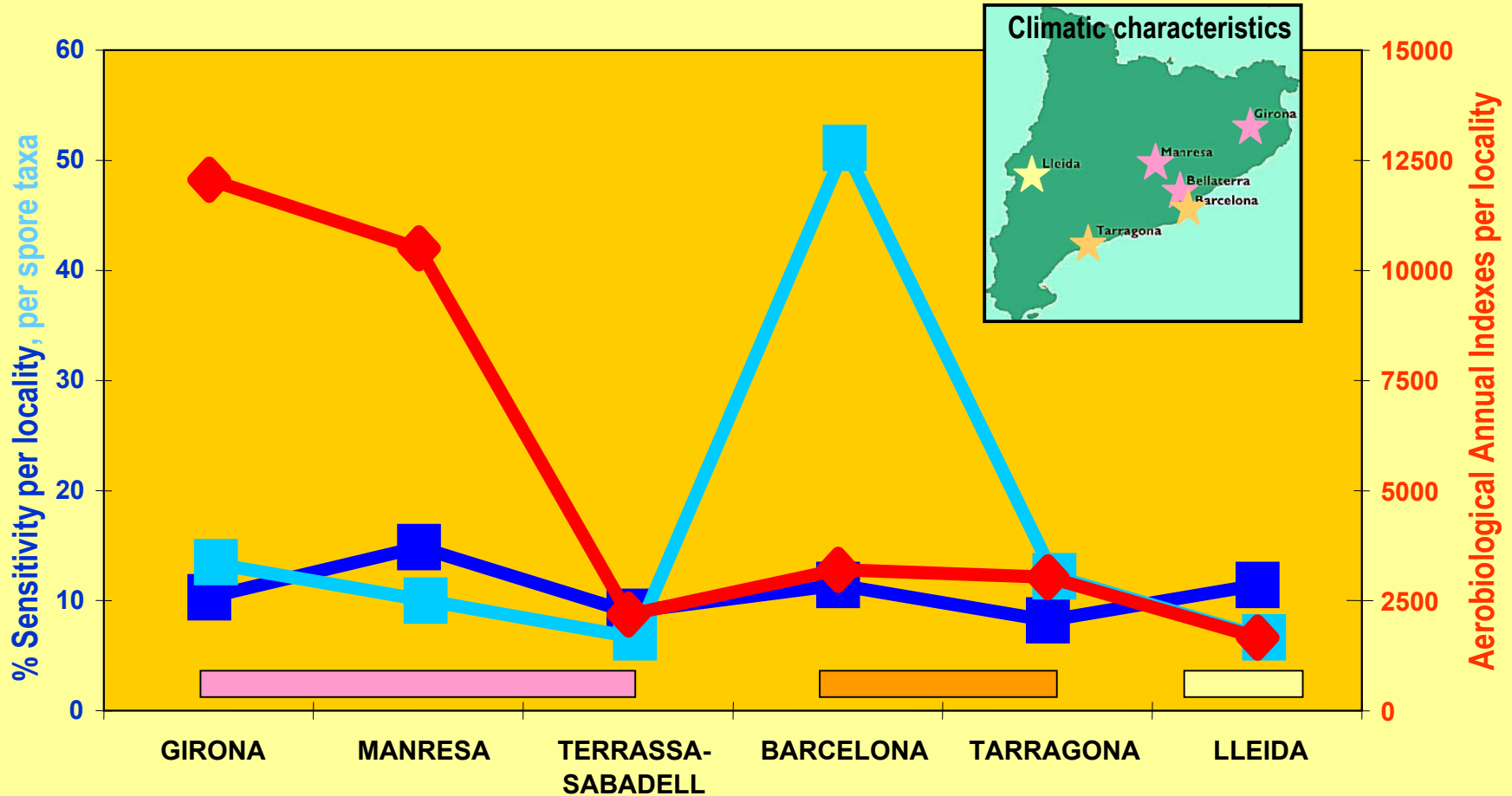
## Aerobiological level

	CLINICAL RESULTS 2002						
	WEEKLY DATA				DAILY DATA		
	Annual Index	% Total	Weekly maximum	Week	Daily maximum	Date	
<b>Aspergillus- Penicillium</b>	sum daily [ ]	Spore	P/m <sup>3</sup> /week	Nr	P/m <sup>3</sup> /day	Date	
BARCELONA	3231	1,1	63,5	17	313,6	A27	
GIRONA	1 12093	1,2	165,2	37	1 1044,4	M8	
LLEIDA	6 1691	0,4	54,6	50	221,2	JL11	
MANRESA	2 10531	0,9	171,6	36	2 904,4	J30	
TARRAGONA	4 3066	1,1	40,8	12	4 280,0	MG14	
TERRASSA-SABADELL	5 2212	0,5	32,8	31	6 210,0	S9	



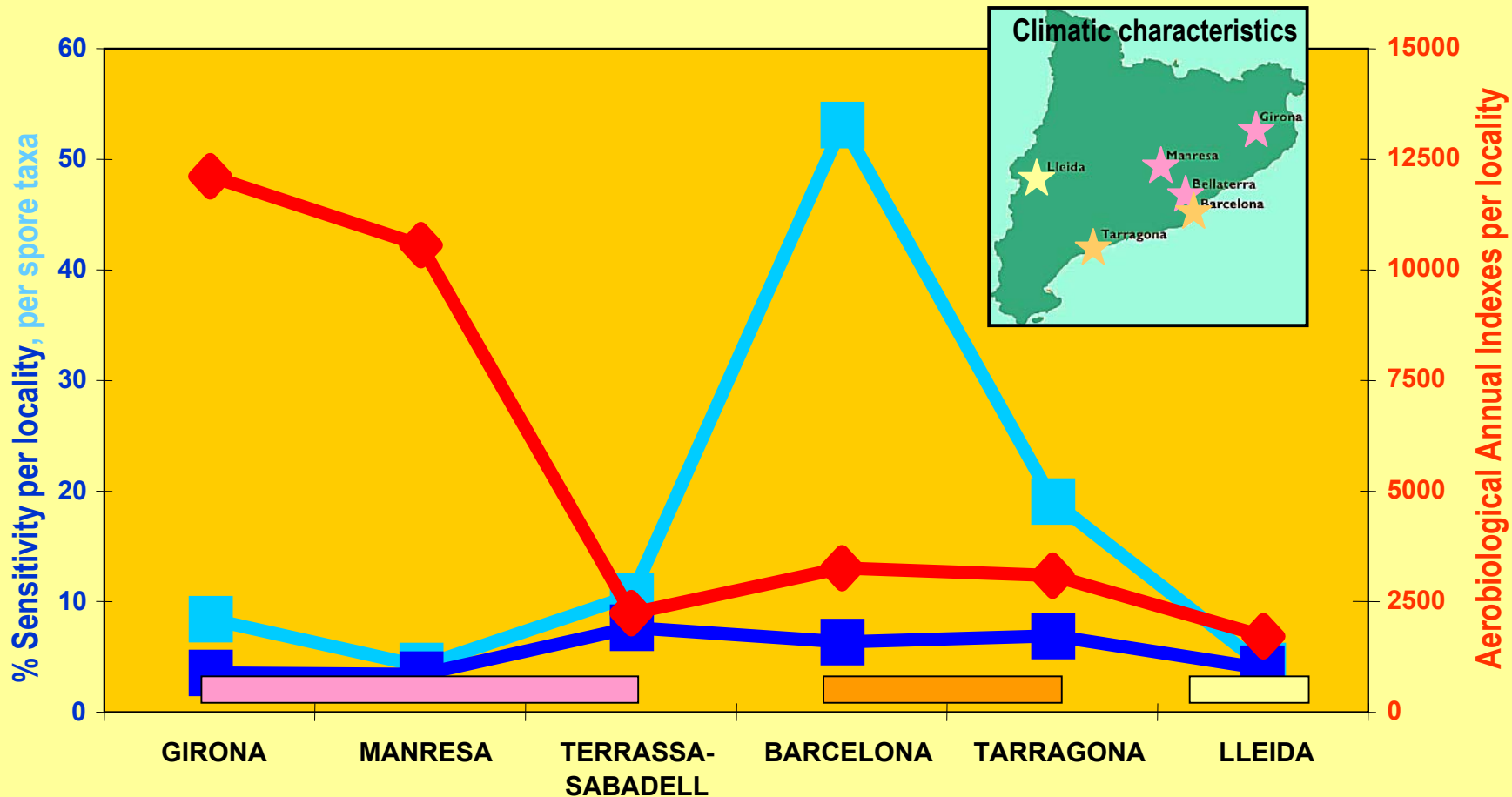
# Sensitivity to Aspergillus fumigatus spores

## Aspergillus-Penicillium Annual Indexes



# Sensitivity to *Penicillium notatum* spores

## *Aspergillus-Penicillium* Annual Indexes

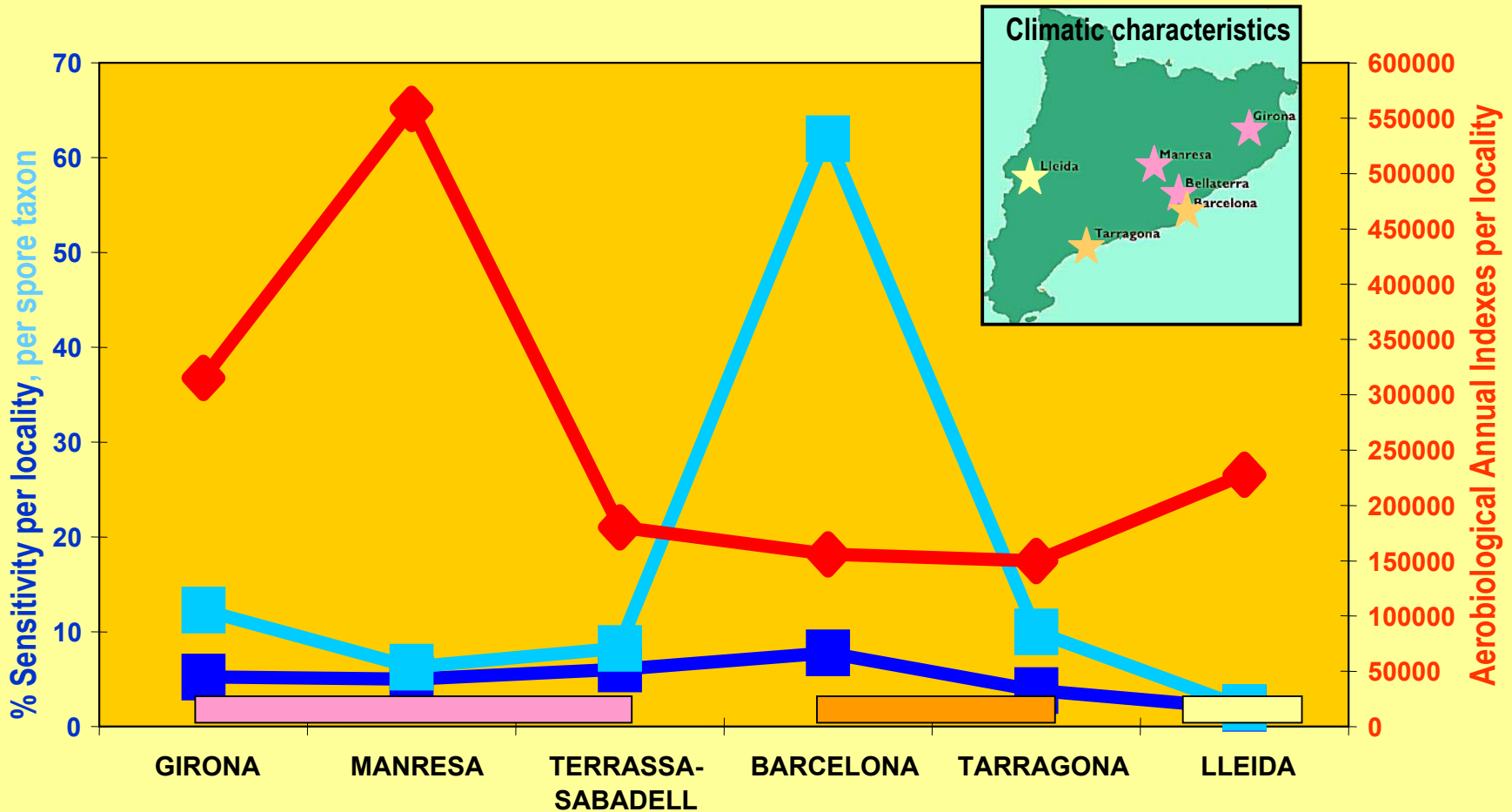


# Cladosporium

	CLINICAL RESULTS 2002				AEROBIOLOGICAL RESULTS 2002					
	YEARLY DATA				YEARLY DATA		WEEKLY DATA		DAILY DATA	
	Nr of Patients	% Total Patients <i>Cladosporium</i>	% Total Patients Studied	% Patients per Locality	Annual Index Sum daily [ ]	% Total Spores	Weekly maximum P/m <sup>3</sup> /week	Week Nr	Daily maximum P/m <sup>3</sup> /day	Date
BARCELONA	31	62,0	2,5	<b>1</b> 7,8	<b>5</b> 155616	54,7	1223,6	29	<b>5</b> 4029,2	JL14
GIRONA	6	12,0	0,5	5,2	315095	32,0	2857,6	29	5269,6	O17
LLEIDA	1	2,0	0,1	<b>6</b> 1,9	<b>3</b> 227584	58,6	2514,8	38	<b>4</b> 4519,2	S17
MANRESA	3	6,0	0,2	<b>4</b> 5,0	<b>1</b> 558300	47,8	5373,6	23	<b>1</b> 6651,6	J6
TARRAGONA	5	10,0	0,4	<b>5</b> 3,8	<b>6</b> 149562	51,4	1307,2	40	<b>6</b> 4006,8	O5
TERRASSA-SABADELL	4	8,0	0,3	6,1	180149	44,5	1625,2	31	5087,6	AG2
Total <i>Cladosporium</i>	50	100,0	4,0	6,1						

# Sensitivity to *Cladosporium herbarum* spores

## *Cladosporium* Annual Indexes

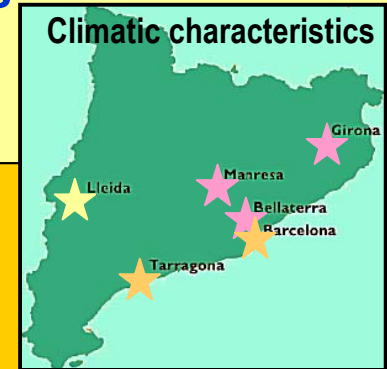
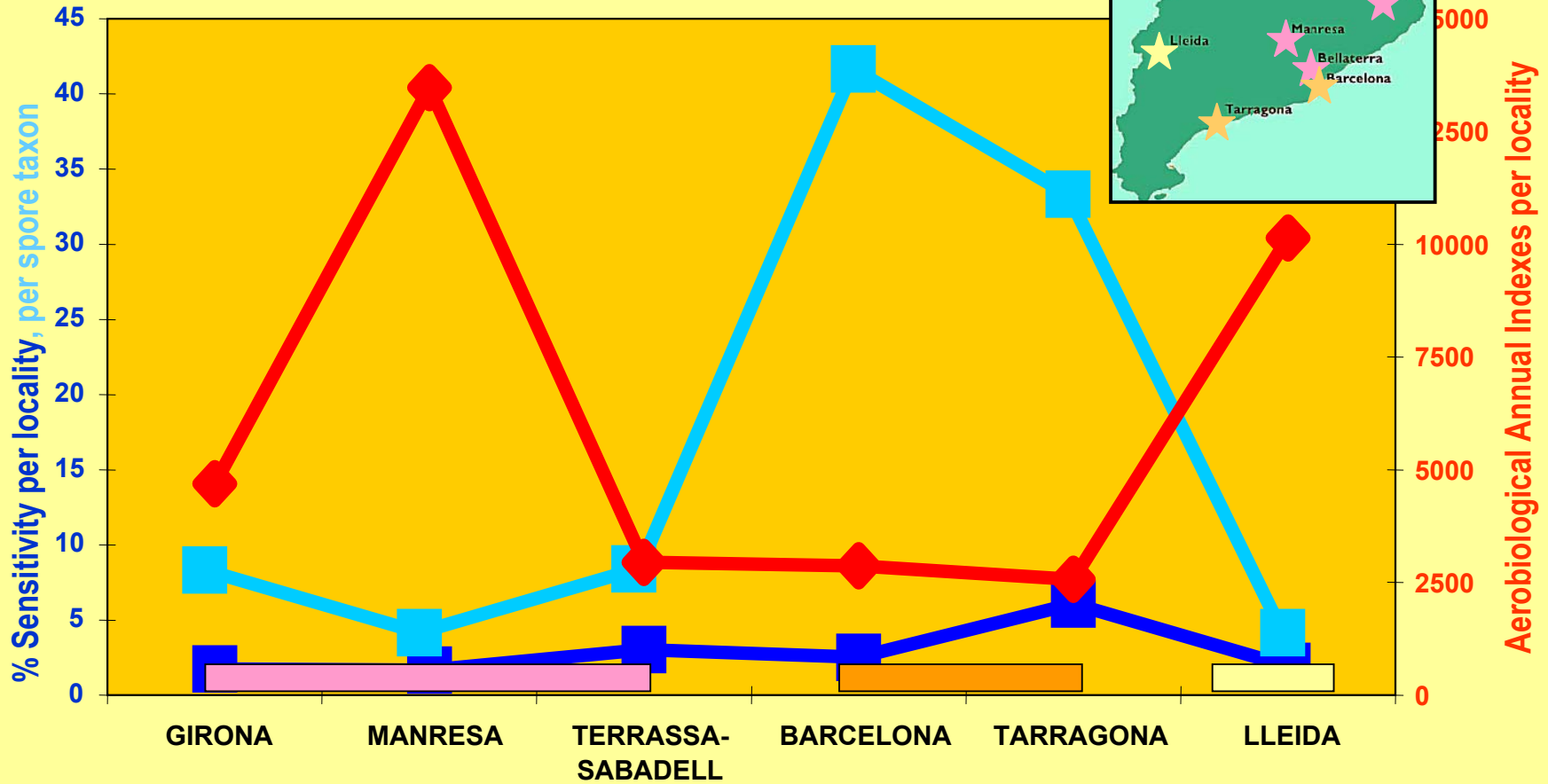


# *Ustilago*

	CLINICAL RESULTS 2002				AEROBIOLOGICAL RESULTS 2002					
	YEARLY DATA				YEARLY DATA		WEEKLY DATA		DAILY DATA	
	Nr of Patients	% Total Patients <i>Ustilago</i>	% Total Patients Studied	% Patients per Locality	Annual Index Sum daily [ ]	% Total Spores	Weekly maximum P/m <sup>3</sup> /week	Week Nr	Daily maximum P/m <sup>3</sup> /day	Date
BARCELONA	10	41,7	0,8	2,5	2870	1,0	62,0	43	296,8	025
GIRONA	2	8,3	0,2	1,7	4684	0,5	51,6	39	123,2	S23
LLEIDA	1	4,2	0,1	1,9	10142	2,6	219,6	45	414,4	2,N13
MANRESA	1	4,2	0,1	1,7	13471	1,2	254,8	26	478,8	J27
TARRAGONA	8	33,3	0,6	6,1	2568	0,9	33,6	40	109,2	05
TERRASSA-SABADELL	2	8,3	0,2	3,0	2946	0,7	57,2	43	142,8	S25
<b>Total <i>Ustilago</i></b>	<b>24</b>	<b>100,0</b>	<b>1,9</b>	<b>2,9</b>						

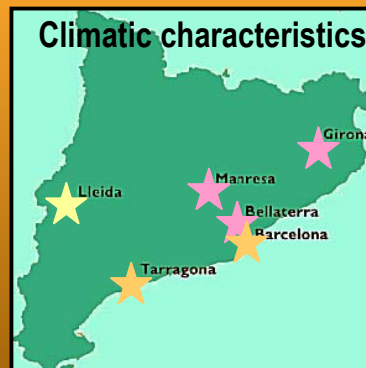
# Sensitivity to *Ustilago* spores

## *Ustilago* Annual Indexes



# Abstract and Conclusions

	LLEIDA		TARRAGONA		BARCELONA		GIRONA		MANRESA		SABADELL-TERRASSA		OVERALL		
	Nr of	%	Nr of	%	Nr of	%	Nr of	%	Nr of	%	Nr of	%	Nr of	%	%
	Patients	Patients	Patients	Patients	Patients	Patients	Patients	Patients	Patients	Patients	Patients	Patients	Patients	Patients enrolled	Patients studied
Patients Enrolled	52	100,0	<b>132</b>	100,0	<b>399</b>	100,0	<b>115</b>	100,0	60	100,0	<b>66</b>	100,0	824	100,0	65,9
<i>Alternaria</i>	6	<b>11,5</b>	21	<b>15,9</b>	55	<b>13,8</b>	26	<b>22,6</b>	28	<b>46,7</b>	15	<b>22,7</b>	151	<b>18,3</b>	<b>12,1</b>
<i>Aspergillus</i>	6	<b>11,5</b>	11	<b>8,3</b>	46	<b>11,5</b>	12	<b>10,4</b>	9	<b>15,0</b>	6	<b>9,1</b>	90	<b>10,9</b>	<b>7,2</b>
<i>Cladosporium</i>	1	<b>1,9</b>	5	<b>3,8</b>	31	<b>7,8</b>	6	<b>5,2</b>	3	<b>5,0</b>	4	<b>6,1</b>	50	<b>6,1</b>	<b>4,0</b>
<i>Penicillium</i>	2	<b>3,8</b>	9	<b>6,8</b>	25	<b>6,3</b>	4	<b>3,5</b>	2	<b>3,3</b>	5	<b>7,6</b>	47	<b>5,7</b>	<b>3,8</b>
<i>Ustilago</i>	1	<b>1,9</b>	8	<b>6,1</b>	10	<b>2,5</b>	2	<b>1,7</b>	1	<b>1,7</b>	2	<b>3,0</b>	24	<b>2,9</b>	<b>1,9</b>
Some of them	10	19,2	35	<b>26,5</b>	95	23,8	31	<b>27,0</b>	29	<b>48,3</b>	17	<b>25,8</b>	217	26,3	17,4



# Abstract and Conclusions

Prevalence of sensitivity to studied moulds in patients with asthma or rhinitis

*Alternaria alternata*  
*Aspergillus fumigatus*  
*Cladosporium herbarum*  
*Penicillium notatum*  
*Ustilago*

Patients Enrolled
<i>Alternaria</i>
<i>Aspergillus</i>
<i>Cladosporium</i>
<i>Penicillium</i>
<i>Ustilago</i>
Some of them

OVERALL		
Nr of Patients	% Patients enrolled	% Patients studied
824	100,0	65,9
151	<b>18,3</b>	<b>12,1</b>
90	<b>10,9</b>	<b>7,2</b>
50	<b>6,1</b>	<b>4,0</b>
47	<b>5,7</b>	<b>3,8</b>
24	<b>2,9</b>	<b>1,9</b>
217	<b>26,3</b>	<b>17,4</b>



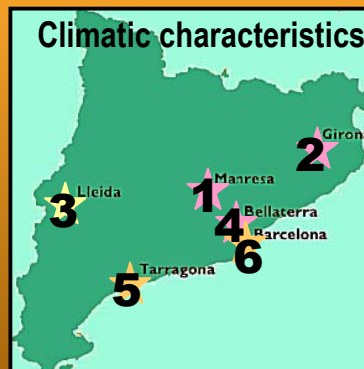


# Abstract and Conclusions

<b>6</b> LLEIDA		<b>3</b> TARRAGONA		<b>5</b> BARCELONA		<b>2</b> GIRONA		<b>1</b> MANRESA		SABADELL- <b>4</b> TERRASSA		OVERALL		
Nr of Patients	% Patients	Nr of Patients	% Patients	Nr of Patients	% Patients	Nr of Patients	% Patients	Nr of Patients	% Patients	Nr of Patients	% Patients	Nr of Patients	% Patients enrolled	% Patients studied

Relation between prevalence of sensitivity and atmospheric spore counts  
More investigation needed

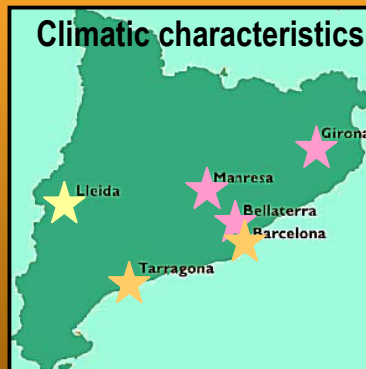
Some of them	10	19,2	35	26,5	95	23,8	31	27,0	29	48,3	17	25,8	217	26,3	17,4
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# Abstract and Conclusions

Geographic differences in hypersensitivity

	LLEIDA		TARRAGONA		BARCELONA		GIRONA		MANRESA		SABADELL-TERRASSA	
	Nr of	%	Nr of	%	Nr of	%	Nr of	%	Nr of	%	Nr of	%
	Patients	Patients	Patients	Patients	Patients	Patients	Patients	Patients	Patients	Patients	Patients	Patients
<b>Patients Enrolled</b>	52	100,0	<b>132</b>	100,0	<b>399</b>	100,0	115	100,0	60	100,0	66	100,0
<i>Alternaria</i>	6	<b>11,5</b>	21	<b>15,9</b>	55	<b>13,8</b>	26	<b>22,6</b>	28	<b>46,7</b>	15	<b>22,7</b>
<i>Aspergillus</i>	6	<b>11,5</b>	11	<b>8,3</b>	46	<b>11,5</b>	12	<b>10,4</b>	9	<b>15,0</b>	6	<b>9,1</b>
<i>Cladosporium</i>	1	<b>1,9</b>	5	<b>3,8</b>	31	<b>7,8</b>	6	<b>5,2</b>	3	<b>5,0</b>	4	<b>6,1</b>
<i>Penicillium</i>	2	<b>3,8</b>	9	<b>6,8</b>	25	<b>6,3</b>	4	<b>3,5</b>	2	<b>3,3</b>	5	<b>7,6</b>
<i>Ustilago</i>	1	<b>1,9</b>	8	<b>6,1</b>	10	<b>2,5</b>	2	<b>1,7</b>	1	<b>1,7</b>	2	<b>3,0</b>
<b>Some of them</b>	10	<b>19,2</b>	35	<b>26,5</b>	95	<b>23,8</b>	31	<b>27,0</b>	29	<b>48,3</b>	17	<b>25,8</b>



**AEROBIOLOGICAL COLLABORATORS:** Jordina Belmonte, Elena Gabarra, David Navarro, Rut Puigdemunt, Silvia Renom and Marta Sardà (Laboratori d'Anàlisi Palinològiques, Universitat Autònoma de Barcelona).

**CLINICAL COLLABORATORS:** Joan Bartra (Hospital Universitari de Girona Dr. Josep Trueta), Pau Amat (Alergocentre. Barcelona), Montse Bosque (Corporació Sanitària Parc Taulí. Sabadell), Pere Gaig (Hospital Universitari de Tarragona Joan XXIII), Raquel Abad (Hospital Universitari de Tarragona Joan XXIII), M<sup>a</sup> Teresa Cerdà (Hospital Universitari de Girona Dr. Josep Trueta), Carme Planell (Hospital Universitari de Girona Dr. Josep Trueta), Mercè Corominas (Ciutat Sanitària i Universitària de Bellvitge. Hospitalet de Llobregat), Pilar García-Ortega (Ciutat Sanitària i Universitària de Bellvitge. Hospitalet de Llobregat), Victòria Cardona (Hospital Universitari Vall d'Hebró. Barcelona), Mar Guilarte (Hospital Universitari Vall d'Hebró. Barcelona), Lluís Marquès (Hospital Santa Maria de Lleida), Teresa Alfaya (Hospital Santa Maria de Lleida), Miquel Baltasar (Hospital Universitari Germans Trias i Pujol. Badalona), Albert Roger (Hospital Universitari Germans Trias i Pujol. Badalona). Esperança Raga (Clínica Plató. Barcelona). Nuria Rubira (Clínica Plató. Barcelona). Rafael Llatser (Hospital Sant Pau i Santa Tecla. Tarragona), Anna Cisteró-Bahima (Institut Universitari Dexeus. Barcelona), M<sup>a</sup> Mar San Miguel-Moncín (Institut Universitari Dexeus. Barcelona), Ramon Leonart (Fundació Altaia. Manresa), Santiago Nevot (Fundació Altaia. Manresa), Josep M<sup>a</sup> Torres-Rodríguez (Clínica Teknon. Barcelona), Zaida Pulido (Clínica Teknon. Barcelona), Marcel Ibero (Consorti Hospitalari de Terrassa). M<sup>a</sup> José Castillo (Consorti

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