2013.11 Exchange seminar

Relationship between Indoor Environmental Factors and Child Health Problems in China
~ Outline and preliminary results ~

Toru Otake (Tohoku univ.)

Research members

Representative: Hiroshi Yoshino (Tohoku Univ., Japan)

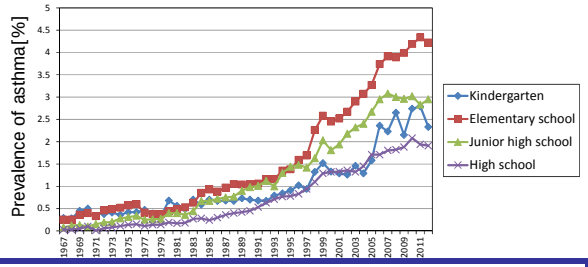
U Yanagi (Kogakuin Univ.)
Kenichi Hasegawa
(Akita Prefecture Univ.)
Atsushi Iwamae (Kinki Univ.)
Zhang Qingyuan
(Tsukuba College of tech.)
Naoki Kagi
(Tokyo Instutute of tech.)
Tomonobu Goto (Tohoku univ.)

Li Zhenhai
(Tongji Univ.)
Zhang Huibo
(Shanghai Jiao Tong Univ.)
Xie jingchao
(Beijing Univ. of Technology)
Ly yang
(Dalian Univ. of Technolog)
Liu jing
(Harbin Institute of Technology)

Background (1/4)

- Childhood allergic diseases were increasing worldwide.

Ex)
- In Japan, allergic diseases of children are increasing.
  Ex) asthma, respiratory symptoms etc.
- The latest prevalence of asthma in pupils is as double as that in the past 10 years.



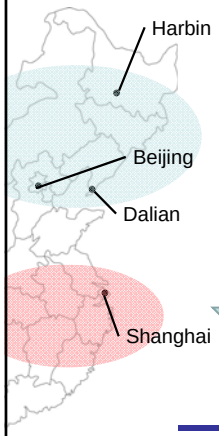
* Ministry of Education, Culture, Sports, Science and Technology

Background (2/4)

- The reason of increment in allergic diseases is not clear. However, indoor environmental factors should be part of the reasons for allergic diseases.
- Dampness in buildings has recently been shown to be associated with adverse health effect on occupants such as causing allergies.

Background (3/4)

How about in China?



Harbin:
extremely cold region
Beijing, Dalian :
cold region
→ Vaper Condensation & frost damage

Shanghai:
mild and humid region
→ High humidity & mold

In the future…
➢ Airtight and insulation will be improved.

The problems will probably increase.

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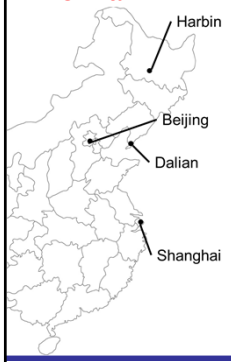
Background (4/4)

- In order to clarify the association between the indoor environment and health problems, we have designed an epidemiological investigation to 4th and 5th grade students in China.



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4) Preliminary results of Phase 2

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Outline: Design of Epidemiological investigation

Phase 1 :
Case-Control study by questionnaire
Investigated period : 2012.11~2012.12
Target : 4th and 5th grade students (n=618)
Location : Shanghai, Beijing, Dalian, Harbin

To determine the association between environmental factors and adverse health effects by **statistical methods**.

Phase 2 :
Case-Control study by field measurements
Investigated period : 2013.1~2013.3
Target : Children/dwellings choosen from Phase 1 (n=51)
Location : Shanghai, Beijing, Dalian, Harbin

To determine the association between environmental factors and adverse health effects by **taking account of actual environment.**

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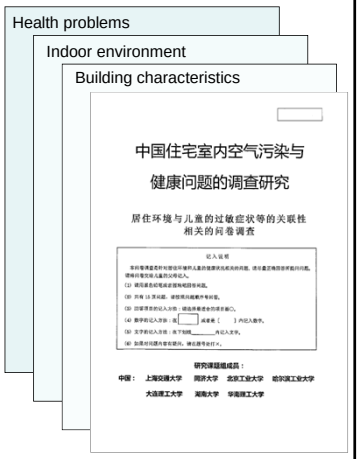
Outline: Outline of Phase 1 (1/2)

- This survey conducted during 2012.11～2012.12
- Questionnaires were distributed to the parents of 4th and 5th grade students. (n=615)
- The parents returned a completed questionnaire by mail one week later.



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Outline: Outline of Phase 1 (2/2)

- 84 questions

Ex)
- **Indoor environment**
- **Installed equipment**
- **Occupant behavior**
- **Building performance**
- **Occupant characteristics**
- **Health problems**

- The American Thoracic Society-Division of Lung Diseases (ATS-DLD) questionnaire was used as a simple tool to evaluate the prevalence of several allergic symptoms.
- These symptoms were judged by a combination of valid responses to specific questions.

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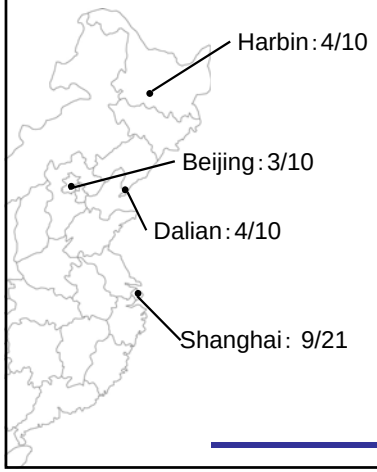
Outline: Outline of Phase 2 (1/2)



- Exposure measurements will be conducted for 51 dwellings including 20 children with symptoms and 31 healthy children.
- This survey had been done during winter season (2012.12~2013.3)
- Another survey in summer season has been conducted. (2013.7~2013.9)

This data is not included in this presentation.

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Outline: Outline of Phase 2 (2/2)

- The following measurements were conducted
  - Indoor (and outdoor) temperature and humidity
  - CO2 concentration
  - Mold and SVOC in house dust
  - VOCs concentration (Indoor and Outdoor)
  - Airborne fungi concentration (Indoor and Outdoor)
  - PM2.5 PM10 (Indoor and Outdoor)
  - Occupants health condition (Interview)

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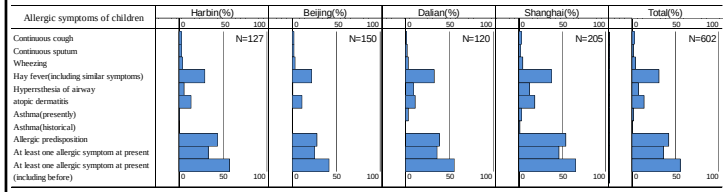
Preliminary results of Phase 1 (1/4)

Distributed Questionnaire : **615**
No. of Respondent : **602**
（Response Ratio : **90.7%**）

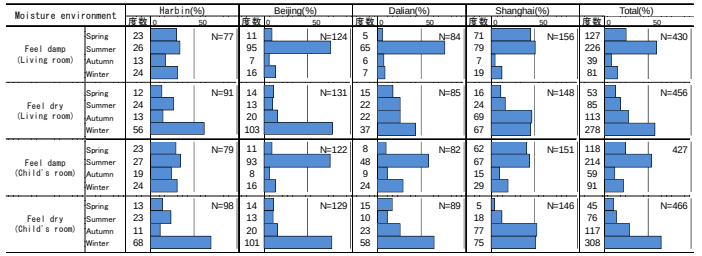
Preliminary results of Phase 1 (2/4)



☐ At least one allergic symptom at present

- The percentage of the children with current allergic symptoms were 36%.
- The highest region is Shanghai (45%) and lowest region is Beijing (25%).

Preliminary results of Phase 1 (3/4)



☐ Damp

- The highest rate appears in summer. (Spring is also high in Shanghai)
- There is no difference among seasons in Harbin.

☐ Dry

- The highest rate appears in winter. (Autumn is also high in Shanghai)

Preliminary results of Phase 1 (4/4)

Dampnes index		Harbin(%)	Beijing(%)	Dalian(%)	Shanghai(%)	Total(%)
Vapor condensation						
Living room	Yes	44	68	56	96	264
	No	62	82	46	92	282
		N=127	N=150	N=120	N=205	N=602
Children room	Yes	57	65	53	98	273
	No	59	84	48	82	273
Visible mold						
Living room	Yes	33	22	26	3	112
	No	68	128	75	145	416
		N=127	N=150	N=120	N=205	N=602
Child's room	Yes	35	20	17	27	99
	No	76	127	85	148	436
Visible damp stain						
Living room	Yes	28	21	24	15	88
	No	74	129	74	171	448
		N=127	N=150	N=120	N=205	N=602
Child's room	Yes	28	21	18	15	82
	No	83	128	78	172	461

- Vapor condensation
  - Vapor condensation is appeared in about half of dwelling.
- Visible mold and damp stain
  - Visible mold and damp stain in Dalian & Harbin were appeared more than that in Beijing and Shanghai.

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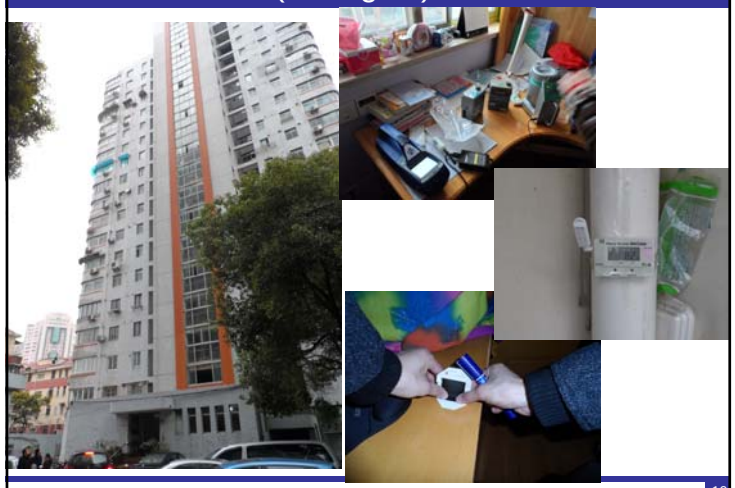
Phase 2: Pictures (Shanghai)



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Phase 2: Pictures (Shanghai)

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Phase 2: Pictures (Harbin)

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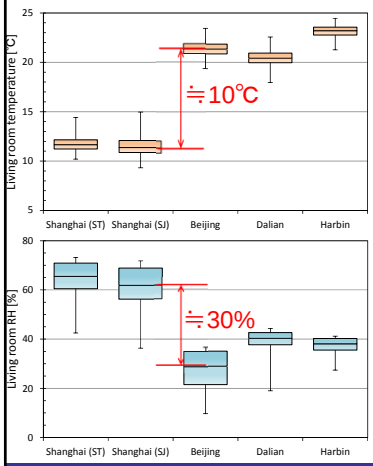
Preliminary results of Phase 2 (1/5)



- There is a difference between Shanghai (ST), (SJ) and the others. (10℃)
- Relative humidity (RH) in Shanghai is higher than the other city's. (30%)

Shanghai①: Tongji University
Shanghai②: Shanghai Jiao Tong University

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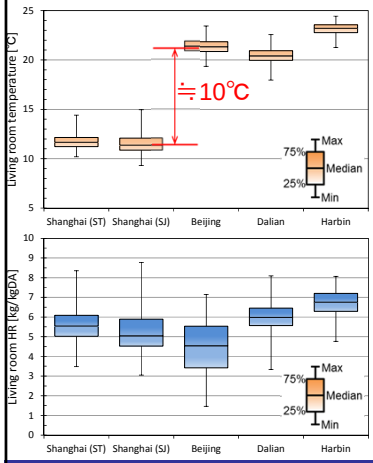
Preliminary results of Phase 2 (2/5)



- There is no difference about humidity ratio (HR).
- The difference of relative humidity is due to temperature difference.

Why the temperature is different?

- District heating systems are used in Beijing, Dalian, and Harbin.
- Room air conditioners are used in Shanghai.

Shanghai①: Tongji University
Shanghai②: Shanghai Jiao Tong University

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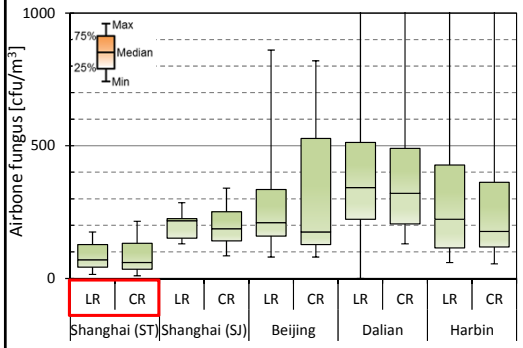
Preliminary results of Phase 2 (3/5)



LR : Living room
CR : Child's room

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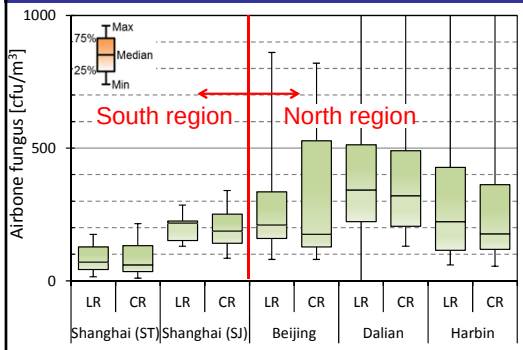
Preliminary results of Phase 2 (4/5)



- Airborne fungus in North region is higher than that in South region.

Preliminary results of Phase 2 (5/5)

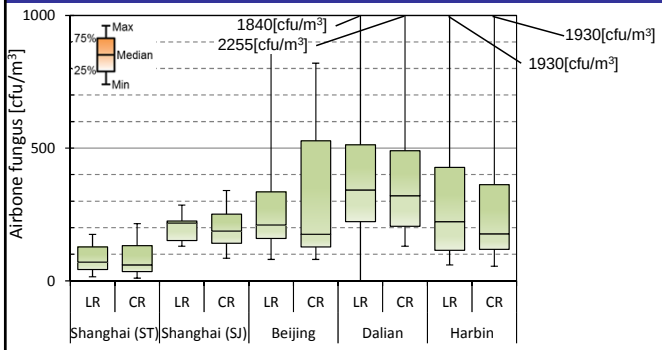


Fig1. Average of total airborne fungus

- The highest airborne fungus appeared in Dalian (2255 [cfu/m^3])
- The median in Dalian is the highest of all area.

Summary

☐ Summary:

- We have designed an epidemiological investigation to 4th and 5th grade students in China.
- The outline and preliminary results were presented.
- In phase 1, the percentage of the children with current allergic symptoms were 36%.
- In phase 1, there are some dwellings which have dampness problem.
  Ex) Feel damp, vapor condensation, visible mold, and damp stain.
- In phase 2, the temperature is different between south region and north region.
- In phase 2, airborne fungus in north region is higher than that in south region.

Future Works

☐ Future works

1. For Phase 1, statistical analysis to clarify the association between the environmental factors and health problems.
2. For Phase 2, determining the relationship between children health and actual environment.

Ex) The relationship between children health and temperature, humidity, airborne fungus, and so on.