WEEKLY EPIDEMIOLOGICAL REPORT

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Damp housing: Does it affect our health? (Part II)

This is the second in a series of two articles on the effect of dampness in indoor environment on inhabitants**.** The first article described the agents which give rise to detrimental health effects and their mechanisms of action. This article focuses on the health effects and recommendations for combating dampness in indoor environment.

Health effects

This section focuses on information gathered from patients, occupational groups, studies involving human volunteers or experimental animals exposed in controlled circumstances etc. Most of these studies are based on small groups of individuals, but both the exposure and the clinical outcomes are characterized better than they are in the epidemiological studies.

Allergic alveolitis

Allergic alveolitis, also known as extrinsic allergic alveolitis and hypersensitivity pneumonitis, is an inflammatory disease involving the distal proportions of airways. The disease has an immunological component, but it has been difficult to find the immunological mechanism by which antigens create granulomatous lymphocytic inflammation in the alveoli and bordering regions. Allergic alveolitis is diagnosed with various clinical and para-clinical tests, including pathological examination and imaging of lungs. Although IgG antibodies were initially believed to be causative, they have been shown to be only markers of exposure.

The studies show sufficient evidence of an association between the presence of moulds and bacteriae in damp indoor environments and allergic alveolitis.

Inhalation Fever

Inhalation fever, also known as toxic pneumonitis, humidifier fever and organic dust toxic syndrome, is a self-limiting syndrome that occurs after inhalation of a wide range of substances, from metal fumes to bacteria and mould spores. The syndrome was first described as humidifier fever during the time when reservoir humidifiers were used. Outbreaks typically occurred where it was important to control the humidity in the environment, like the printing shops. Studies on farmers showed that the exposure to mould spores leading to inhalation fever exceeds the levels that induce allergic alveolitis by one to two folds.

Infection with moulds

Infection with *Aspergillus* and other fungi such as *Fusariuum* spp. is a well known complication in the treatment of patients who are immuno-compromised (e.g. due to treatment for cancer or infection with human immunodeficiency virus).

Some of these patients contract mould infection after being exposed to the pathogen indoors, not because there is excess water due to damages in the facility where they are being treated, but because an opportunistic, ubiquitous mould finds a suitable host. No studies have been conducted to link such infections to mould in the indoor environment. Furthermore, the type of disease appears to determine the type of infection, and the infecting agents are not those typically encountered in damp houses. *Aspergillus* appears to be the most aggressive of these fungi, giving rise to infections in patients with less severe airway disease also (e.g. cystic fibrosis, asthma and chronic obstructive pulmonary disease). People who are atopic sometimes contract a severe infection in which aspergillosis causes an allergic reaction with the infection, giving the person wheeze, pulmonary infiltrates and eventually fibrosis. This syndrome can also be found with an aspergilloma.

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People with atopy sometimes develop sinus disease as a consequence of *Aspergillus* infection or presence. Exposure to mould has been proposed as the cause of chronic sinusitis, as these patients show exaggerated humoral and cellular responses to moulds.

Asthma-like symptoms

Children who have lived for a long time in houses with high concentrations of airborne β-glucan had symptoms such as dry cough, nasal and throat irritation, hoarseness, tiredness and headache more frequently. A higher prevalence of atopy have been associated with high concentrations of airborne β-glucan. These children had increased airway responsiveness to methacholine and amplified peak flow variations.

A few published cases have shown that the occupants of houses with signs of mould and high levels of airborne glucan were afflicted with asthma-like symptoms until they moved. These studies linking glucan with symptoms and signs of disease are insufficient to conclude that there is a causal relationship with glucan, but glucan may be just a marker of exposure to another agent.

Other effects

Several other effects of exposure to mould have been discussed in the context of indoor air, including toxic, immunological, reproductive and neuropsychiatric symptoms and syndromes.

Inhaled mycotoxins have been suggested to play a role in adverse reproductive outcomes among farmers.

Acute pulmonary haemorrhage was associated with indoor exposure to mycotoxins and it was suggested after studying a cluster of 10 infants who had similar clinical features. The implicated mycotoxin was trichothecenes produced by *S. chartarum*. A study showed that people exposed to satratoxin in their houses form albumin adducts in their blood, as found in rats exposed experimentally to satratoxin . Although mycotoxins can induce a wide range of adverse health effects in both animals and human beings, the evidence that they play a role in health problems related to indoor air is extremely weak.

A direct association of mycotoxins with cancer has not been demonstrated. However, it has been speculated that inhalation of aflatoxins and ochratoxin in industries such as peanut and livestock feed processing (in which exposure to grain dust occurs) might increase the incidences of liver cancer, cancers of the biliary tract and salivary gland and multiple myeloma. Although adduct formation (a process which could be the start of a cancerous cell) with aflatoxin has been found in such workers, there is no evidence to the fact that prevalence of cancer was altered by exposure to damp indoor air.

It has been hypothesized that endotoxins play a role in the pathogenesis of rheumatic diseases in damp buildings. A Finnish group studied the occurrence of rheumatic diseases associated with dampness and suggested that the symptoms could be attributed to exposure to mould spores. In a later publication the author proposed that endotoxins and other triggers of the innate immune responses might play a role, although the exposure levels are much lower than those in situations where joint pain is more prevalent, as on farms and among bird fanciers.

Recommendations

- Persistent dampness and microbial growth on interior surfaces and in building structures should be avoided or minimized, as they may lead to adverse health effects.

- Indicators of dampness and microbial growth include the presence of condensation on surfaces or in structures, visible moulds perceived mouldy odour and a history of water damage, leakage or penetration. Inspection and appropriate measurements if necessary can be used to confirm indoor moisture and microbial growth.

- As the relations among dampness, microbial exposure and health effects cannot be quantified precisely, no quantitative health-based guideline values or thresholds can be recommended for acceptable levels of contamination with microorganisms. Instead, it is recommended that dampness and mould-related problems be prevented. When they occur, they should be rectified because they increase the risk of hazardous exposure to microbes and chemicals.

- Well-designed, well-constructed, well-maintained buildings are critical for the prevention and control of excess moisture and microbial growth as they prevent thermal bridges and the entry of liquid or vapour-phase water.

- Management of moisture requires proper control of temperatures and ventilation to avoid excess humidity, condensation on surfaces and excess moisture in materials. Ventilation should be distributed effectively throughout spaces and stagnant air zones should be avoided.

- Building owners are responsible for providing a healthy workplace or living environment free of excess moisture and mould by ensuring proper building construction and maintenance. The occupants are responsible for managing the use of water, heating, ventilation and appliances in a manner that does not lead to dampness and mould growth. Local recommendations for different climatic regions should be provided to control dampness mediated microbial growth in buildings and to ensure desirable indoor air quality.

- Dampness and mould may be particularly prevalent in poorly maintained housing for low-income people. Remediation of the conditions that lead to adverse exposure should be given priority to prevent an additional contribution to poor health in populations who are already living with increased burden of disease

Source

Dampness and moulds, available from

www.euro.who.int/__data/assets/df_file/0017/43325/E92645.pdf

Compiled by Dr. Madhava Gunasekera of the Epidemiology Unit

Table 1: Vaccine-preventable Diseases & AFP

05th – 11th November 2011 (45th Week)

Disease	No. of Cases by Province									Number of cases during current week in 2011	Number of cases during same week in 2010	Total number of cases to date in 2011	Total number of cases to date in 2010	Difference between the number of cases to date in 2011 & 2010
	W	C	S	N	E	NW	NC	U	Sab					
Acute Flaccid Paralysis	00	00	00	00	00	00	00	00	00	00	02	76	74	+ 04.2 %
Diphtheria	00	00	00	00	00	00	00	00	00	-	-	-	-	-
Measles	00	00	00	00	00	00	00	00	00	00	01	115	87	+ 32.2 %
Tetanus	00	00	00	00	00	00	00	00	00	00	00	24	21	+ 14.3 %
Whooping Cough	00	00	00	00	00	00	0	00	00	00	01	49	36	+ 36.1 %
Tuberculosis	00	214	01	12	41	34	02	04	18	326	215	8322	8877	- 06.2 %

Table 2: Newly Introduced Notifiable Disease

05th – 11th November 2011 (45th Week)

Disease	No. of Cases by Province									Number of cases during current week in 2011	Number of cases during same week in 2010	Total number of cases to date in 2011	Total number of cases to date in 2010	Difference between the number of cases to date in 2011 & 2010
	W	C	S	N	E	NW	NC	U	Sab					
Chickenpox	03	00	04	02	00	00	05	01	01	16	43	3701	3009	+ 23.0 %
Meningitis	00	01 KN=1	00	01 JF=1	01 AM=1	01 KG=1	03 AP=2 PO=1	00	00	07	13	763	1415	- 46.1 %
Mumps	02	01	05	03	01	04	02	00	02	20	23	2820	1057	+ 166.8 %
Leishmaniasis	00	00	01 HB=1	00	00	00	11 AP=10 PO=1	00	00	12	07	707	355	+ 99.1 %

Key to Table 1 & 2

Provinces: **W**: Western, **C**: Central, **S**: Southern, **N**: North, **E**: East, **NC**: North Central, **NW**: North Western, **U**: Uva, **Sab**: Sabaragamuwa.

DPDHS Divisions: **CB**: Colombo, **GM**: Gampaha, **KL**: Kalutara, **KD**: Kandy, **ML**: Matale, **NE**: Nuwara Eliya, **GL**: Galle, **HB**: Hambantota, **MT**: Matara, **JF**: Jaffna, **KN**: Killinochchi, **MN**: Mannar, **VA**: Vavuniya, **MU**: Mullaitivu, **BT**: Batticaloa, **AM**: Ampara, **TR**: Trincomalee, **KM**: Kalmunai, **KR**: Kurunegala, **PU**: Puttalam, **AP**: Anuradhapura, **PO**: Polonnaruwa, **BD**: Badulla, **MO**: Moneragala, **RP**: Ratnapura, **KG**: Kegalle.

Data Sources:

Weekly Return of Communicable Diseases: Diphtheria, Measles, Tetanus, Whooping Cough, Chickenpox, Meningitis, Mumps.

Special Surveillance: Acute Flaccid Paralysis.

Leishmaniasis is notifiable only after the General Circular No: 02/102/2008 issued on 23 September 2008. .

Dengue Prevention and Control Health Messages

Check the roof gutters regularly for water collection where dengue mosquitoes could breed.

Table 4: Selected notifiable diseases reported by Medical Officers of Health

05th – 11th November 2011 (45th Week)

DPDHS Division	Dengue Fever / DHF*		Dysentery		Encephalitis		Enteric Fever		Food Poisoning		Leptospirosis		Typhus Fever		Viral Hepatitis		Human Rabies		Returns Received
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	%
Colombo	44	8232	0	170	0	6	8	281	0	60	7	432	0	8	2	66	0	2	**46**
Gampaha	9	3433	0	121	0	19	0	87	0	83	4	474	0	24	0	340	0	6	**20**
Kalutara	2	1141	0	147	0	9	0	75	0	26	1	348	0	4	0	13	0	1	**8**
Kandy	26	1193	8	361	0	7	0	38	0	40	0	159	2	101	0	52	0	0	**57**
Matale	2	259	2	186	0	4	0	35	0	23	1	155	0	14	0	12	0	0	**50**
Nuwara	2	215	1	317	0	4	0	57	0	110	0	50	1	65	0	31	0	1	**23**
Galle	4	748	0	99	0	6	0	30	0	8	2	207	0	40	0	11	0	5	**42**
Hambantota	2	363	0	61		4	0	5	0	29	0	484	0	61	0	15	0	1	**42**
Matara	8	510	2	87	0	3	1	19	0	32	5	346	0	80	1	23	0	1	**76**
Jaffna	7	305	5	329	0	3	1	263	0	92	0	2	2	199	0	30	0	1	**73**
Kilinochchi	1	57	0	37	0	3	0	11	0	13	0	2	0	12	0	3	0	0	**25**
Mannar	3	48	0	23	0	1	0	32	0	83	0	13	0	33	0	2	0	0	**100**
Vavuniya	0	72	1	36	1	14	0	10	0	58	0	45	0	2	0	2	0	0	**50**
Mullaitivu	0	16	0	62	0	1	0	7	0	9	0	5	0	2	0	2	0	0	**50**
Batticaloa	40	892	0	569	0	5	0	7	0	31	0	27	0	3	0	2	0	7	**29**
Ampara	0	149	3	211	0	1	0	11	0	50	0	57	0	1	0	9	0	0	**29**
Trincomalee	0	147	2	641	0	2	0	10	0	12	0	92	0	7	0	8	0	1	**17**
Kurunegala	13	864	1	332	0	12	0	95	1	87	5	1511	0	77	3	65	0	4	**48**
Puttalam	0	437	0	176	0	1	0	32	0	48	0	119	0	18	0	7	0	2	**25**
Anuradhapu	1	256	8	135	0	2	0	5	0	34	0	240	0	17	0	25	0	1	**32**
Polonnaruw	0	268	0	118	0	1	0	14	0	22	0	84	0	1	0	17	0	0	**29**
Badulla	1	548	2	341	0	6	0	55	0	24	0	77	0	82	2	65	0	0	**29**
Monaragala	0	245	4	132	0	4	0	36	0	13	0	179	0	73	1	89	0	0	**18**
Ratnapura	1	901	0	461	0	7	0	51	0	26	4	543	0	29	1	65	0	2	**22**
Kegalle	0	876	0	108	0	12	0	75	0	24	0	326	0	33	0	245	0	0	**0**
Kalmune	0	35	0	548	0	0	0	3	0	85	0	6	0	2	0	3	0	1	**8**
SRI LANKA	**166**	**22246**	**39**	**5808**	**01**	**137**	**10**	**1344**	**01**	**1122**	**29**	**5983**	**05**	**988**	**10**	**1202**	**00**	**36**	**36**

Source: Weekly Returns of Communicable Diseases WRCD).
***Dengue Fever / DHF** refers to Dengue Fever / Dengue Haemorrhagic Fever.
****Timely** refers to returns received on or before 11th November, 2011 Total number of reporting units =329. Number of reporting units data provided for the current week: 210
A = Cases reported during the current week. **B** = Cumulative cases for the year.

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