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Authorities microbiological oriented approach creates confusion in Swedish buildings

Dr Thomas Alsmo

Abstract - **In the last decades problems with indoor air quality have increased in the Swedish housing, office and school buildings. The problem that is being addressed is the mucosal and respiratory symptoms, asthma, skin symptoms, fatigue and headaches, that is to say, a common health-problem that affects people. The Swedish authorities environmental reporting is communicated to the extent of the problem has been constant since the early 1990s. This is during a period of extensive efforts made and resources consumed both in research and through measures in the buildings to try to solve the current problem, but thus, efforts have not had the intended effect. There are basic questions about authorities management about the indoor air environment about indoor environment and the aim of this project is to examine the relevance of the effected by the authorities. The project examines two areas, the microbial work model the authorities used for the indoor environment and the problem that the authorities claim about wood burning stoves in homes. The result shows that authorities action has created for a flawed model to be used. In addition, this model a) it is not possible to identify many of the real problems that exist in buildings, b) it often gives a wrong picture of the problem and c) it frighten many of those who live in the buildings. For Sweden it is a big issue, if the authorities really live up to what the government ordered them to do, with the environmental reporting, which has formulated as follows:**

- **to provide a basis for setting priorities, which factors in indoor environment that has meaning and**
- **to be a basis for a decision to promote a great development from a health perspective.**

Keywords - **Mold investigators, Microbial investigation, Environmental investigators, Emissions measured**

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BACKGROUND

In the last decades problems with indoor air quality have increased in the Swedish housing, Office and school buildings. The problem that is being addressed is the mucosal and respiratory symptoms, asthma, skin symptoms, fatigue and headaches, that is to say, a common health-problem that affects people. The Swedish authorities environmental reporting is communicated to the extent of the problem has been constant since the early 1990s. This is during a period of extensive efforts made and resources consumed both in research and through measures in the buildings to try to solve the current problem, but thus, efforts have not had the intended effect**.** Aim to government environmental reporting is

- to provide a basis for setting priorities, which factors in indoor environment that has meaning and
- to be a basis for a decision to promote a great development from a health perspective.

In the latest report is notified that the main causes of the health effects of indoor environment is moisture and microbiological damage in buildings. It should be noted that a focus is made on the building's technical microbiological status and no information given how all other factors, outside the construction area, affecting the environment in buildings taken into account [1, 2]. It is well known that the problem in conjunction with the indoor environment is diffuse. No links have been established (dose-response relationships) between the health problems that are addressed and deficiencies in the technical status of buildings [3-11]. However, Swedish authorities manage the area as if this should be confirmed [12, 13]. Regard the inside environment of workplaces there are guidelines and limits based on dose-response relationships and long-term exposures [14], but these values are considered to be too high. In the absence of scientifically confirmed hypotheses instead an agreement between authorities, researchers and industry players has been made. This agreement means that they believe that a link should exist and this perception acts as a substitute [15-21]. There are risks with this management that special interests are taking over the development and there is in Sweden a range of actors. These operators have been using microbial laboratories and created their own methods and limit values, without scientific basis, but with the "accepted" working model these actors will affect the development [19]. Investigations are carried out to locate, they believe, where harmful microbial plant exist and propose actions. Documents have been prepared to support environmental investigators, clients of the interior environment investigations and users in moisture- and mold damaged buildings. However, scientific management are missing, but leading scientists and government officials have been involved in producing the document and given it their support [22]. The result is that the problem surrounding the Swedish indoor environment is both unclear and difficult to understand for the layman. A consequence is that large resources are consumed without solving the problems and the environment is also hygienic loaded in many buildings. This creates a basis of ill-health, but are not taken into consideration due to limited microbial approach [1, 7 – 11, 23]. A similar area as recently alleged by authorities is small-scale wood burning in homes that are considered to be a significant source of pollution. Emission spread shall be made, in this context, the particles less than 1.0 µm, via the chimney to the neighborhood, spread to other homes that get

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polluted and considered to be health problems. Authorities are complaining about the uncertainty prevailing in the matter and that the knowledge of wood burning on a local level is limited. Despite this, Swedish authorities make the following strong statement [24].

- In Europe the small-scale stove burning with wood in homes contributes to mortality at 400 000 people per year.
- Only in Sweden the small-scale stove burning with wood in homes contributes for a mortality of 5 000 people per year.

There are basic questions about authorities management both in the description of wood stoves emission to other homes and the microbial work model used for the area. The aim of this project is to examine the relevance of the statements made by the authorities and where the stoves wood burning in local residential is a current example of Swedish authorities handling of the area.

METHODOLOGY

This project investigate the microbiological oriented approach that Swedish authorities refer to in the field of air environment in non-industrial buildings and how this model has been developed [19, 22]. A literature review is conducted and when it´s necessary a direct contact with the relevant authorities for clarification on various issues is taken. The project also includes studying the relevance of authorities opinion on the small-scale wood burning that take place in homes. This is done by studying the air environment around a building with wood-fired ovens, carry out measurements in the environment adjacent to this building and analyzing how the air quality outside of the building is affected by the small-scale wood burning. The measurements are carried out on two occasions, before firing to study air quality when the ovens are not in operation as well as during wood burning to study how the small-scale wood burning is affecting the air environment adjacent to the building concerned. The measurements are carried out outside the façade to the East, South, West and North. When wood burning the measuring is complemented with measuring 20 meter from each façade to study how the air quality changes in relation to the level of direct connection to the facade. As a basis for assessing air environment around this building measurements are carried out on forty-four geographically diverse sites in Sweden. This project uses only one instrument for all measurements, TSI laser-sampler model 8220 which solves the problems regarding the calibration of measurement methodology. Emissions are measured in the interval 0.3-0.5 and 0.5-1.0 µm, including all particles in the size range, including the microbial factions. A set consists of five individual measurements. At each measurement about three litres of air is treated and the mean value for each measurement is calculated and used in the report [25]. Measured data are stored in the instrument and via the cable is transferred to the computer using the Microsoft Excel computer program to implement data processing, analysis and compilation of finally report. The variety used is the number of particles per cubic meter.

RESULTS

The results from emission measurements on the forty-four places in Sweden shows that the quality of the outdoor air varies widely both geographically and over time. For size range of 0.3-0.5 µm the amount of emissions vary, the highest measured value of 318 million particles per cubic meter, the lowest measured value 150 thousand particles per cubic meter, with a mean of all forty-four measurement points at 27.8 million particles per cubic meter. For the corresponding levels for the size range 0.5-1.0 µm the highest measured value is 126 million particles per cubic meter, the lowest measured value 65 thousand particles per cubic meter, with a mean of all forty-four measurement locations 5.4 millions of particles per cubic meter. The results are presented in Fig. 1 and table 1. As stated the quality of outdoor air varies sharply and therefore the presentation of the results in Fig. 1 will be done with help from the logarithmic scale. It should be noted that the base of indoor air is the outdoor air that surrounds the building. Thus, the indoor air quality also varies greatly over time as a result of the changes that occur in the air around the building. This condition cannot change through technical measures in the buildings concerned, but this is not indicated in the authority based model. The cause of what affects air quality are particles less than 1.0 µm outdoors, descending mainly from emissions in other countries and are controlled by winds. These "fine particles" can remain in the atmosphere for a number of day´s [26].

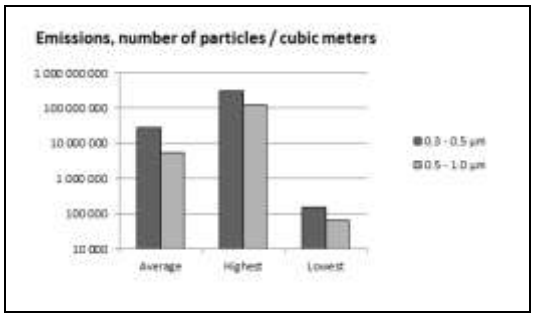

Figure 1. (Logarithmic scale) The amount of emissions, particle intervals 0.3-0.5 and 0.5-1.0 µm in forty four different places in Sweden (number of treatment measurement data 220 pieces). The figure shows the average, highest and lowest measured values.

TABLE 1. The amount of emissions, particle intervals 0.3-0.5 and 0.5-1.0 µm in forty four different places in Sweden (number of treatment measurement data 220 pieces). The table shows the average, highest and lowest measured values.

	0.3 - 0.5	0.5 - 1.0
Average	27 804 311	5 441 251
Highest	318 947 840	126 836 872
Lowest	153 868	65 503

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The results of the measurements of the small-scale wood burning are reported in figures 2 and 3 and tables 2 and 3. The building, where the measurement operation took place, is located in a normal House suburb of Stockholm, and with the following climatic conditions during measurement at the moment; temperature +10 °C, no rainfall and wind direction South. The only value that clearly provides the higher level is the level next to the southern facade of the building in relation to the other facades. For the fraction 0.3-0.5 µm 25.2 million per cubic meter were measured and for faction 0.5-1.0 µm 3.1 million per cubic meter were measured and the reason for the higher level is probably the southern wind. However, emission levels, given the results in Figure 1 and table 1, are not notable but it is indicated that wood burning has a certain impact immediately adjacent to the building. Measuring 20 meters from the façade shows that the emission load, in principle is back on the same level who for the other facades. With regard to the northern façade is noted, the level is high in both fractions, in the local comparison between the facades. That can be explained by the fact that in connection with the north façade there is a wooded area which give off emissions and the southern wind direction caught up the emissions against the northern facade, unlike the other facades where air can freely spread emissions further in the direction of the wind. The assessment that the emissions from the local ovens from homes spreads to other homes, the way that the authorities describe, the results from this project show can be considered as non-existent. However, a deeper study with a wider basis should be conducted, to ensure statistical facts. But the opinion from the authorities around the wood burning ovens in this type of environment is likely to create more confusion, and the risk is that uncertainty growing further in the work with the environment in the Swedish buildings. Regarding the microbial working model that the Swedish authorities work after is based on research, are controlled from authorities themselves. This means they have control over the requirements on the research, the people who will lead the researches and the financing of the research projects. During this project a direct dialogue with the authorities concerned has been implemented, but from the authorities, no clarification has been recognised in the relevant issues. It's a bit odd that, both the local and the central authorities, do not have interest in new research-based materials that were presented at the contacts but instead, without further consideration, they stick to in the building related working models [19, 22, 28, 32]. Authorities should have requirement on themselves that, its works should be performed with high precision and accuracy, but in this area, it is clear that something is not correct. Today, there are close contacts between authorities, researchers, microbial laboratories and other stakeholders as well as in different contexts the existence of these are the same people. This is a relationship that can be questionable in view of conflict of interest situations [17-22]. Swedish universities and scientists have so far been less criticized than other social sections, but there are serious problems with how research is governed in Sweden. In research, there are different types of management forms.

1. The research is based on a query, where the researcher asks a question (hypothesis), looking out a method to answer the question, conducting investigation and come up with an answer. Because the procedure is clear, the answer might be used by other researchers to move forward [33, 34]. This type of research is, in the area that this project concern, as soon as an exception.
2. An alternative approach is the research that is not based on a clear question, and can therefore produce no clear answers. Among these research reports and dissertations are given in texts general views on the subject, but ignores a variety of important parameters, which means that the research model doesn't really work, but otherwise without fault in the detail. This action is called in different research contexts for "fake" [33, 34].
3. Another type of research is that the researcher already from the beginning decided which result it will be, and that in different research contexts is referred to as a "sham". In this category are found research on openly politicized areas such as the environment, education and some medical specialties. Research receives funding to produce a "scientific" report that government or company can refer to [33, 34].

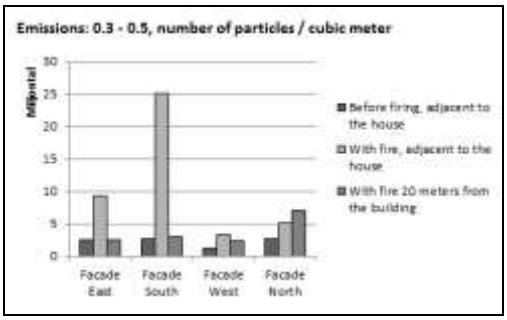

Figure 2. Amount of emissions, particle range 0.3-0.5 µm outside building with two stoves for wood burning. The measurements are carried out in connection with the respective façade as well as during firing even 20 meters from the respective façade.

TABLE 2. Amount of emissions, particle range 0.3-0.5 µm outside building with two stoves for wood burning. The measurements are carried out in connection with the respective façade as well as during firing even 20 meters from the respective façade

0.3 – 0.5 µm	
	Before firing, adjacent to the house
Facade East	2 483 921
Facade South	2 656 336
Facade West	1 250 414
Facade North	2 689 516
	With fire, adjacent to the house
Facade East	9 393 586
Facade South	25 165 670
Facade West	3 409 745
Facade North	5 162 139
	With fire 20 meters from the building
Facade East	2 586 539
Facade South	3 101 751
Facade West	2 432 675
Facade North	6 985 367

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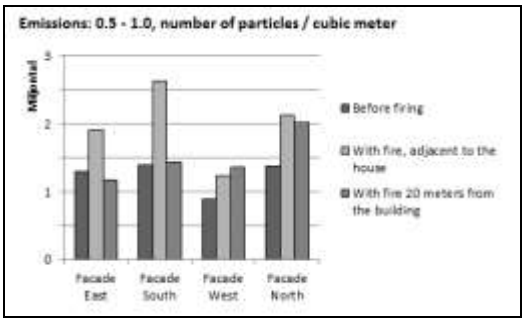

Figure 3. Amount of emissions, particle range 0.5-1.0 µm outside building with two stoves for wood burning. The measurements are carried out in connection with the respective façade as well as during firing even 20 meters from the respective façade.

TABLE 3. Amount of emissions, particle range 0.5-1.0 µm outside building with two stoves for wood burning. The measurements are carried out in connection with the respective façade as well as during firing even 20 meters from the respective façade

0.3 – 0.5 µm	
	Before firing
Facade East	1 297 353
Facade South	1 389 369
Facade West	892 021
Facade North	1 382 264
	With fire, adjacent to the house
Facade East	1 910 704
Facade South	2 623 873
Facade West	1 228 685
Facade North	2 120 690
	With fire 20 meters from the building
Facade East	1 171 510
Facade South	1 433 051
Facade West	1 356 708
Facade North	2 023 541

The Swedish universities have not stand up, as in the research context call a genuine research, point 1 above. Instead they apply a combination of paragraphs 2 and 3, the trend has been driven by a reform from 1999 and saying that universities should pay a PhD full pay for four years. During that time the researcher must completely finished his thesis [34, 35]. For this to be possible, they often choose a small topics and well-known methods and the thesis becomes more of a "apprentice's examination work". All dimensions that are not quality measures contribute to an internal corruption of the University as an intellectual activity. Swedish universities are now producing a lot of "research" that hardly can be called scientific, leading to confusion [34]. This is most likely an explanation for the development of the working model that the authorities in Sweden applies in the area of environment in non-industrial buildings.

CONCLUSION

The results of this project shows that there are question marks about Swedish authorities handling of the area of the environment in non-industrial buildings. With regard to the example of the small-scale wood burning, authorities have not been able to scientifically prove the statements made regarding the link to increased mortality. In order to develop the Swedish indoor environment, who in many places is unhealthy especially in school buildings [9, 10, 23, 36], it is necessary that government agencies start to use a working model that takes into account all parameters affecting indoor environment. In research it will be safest by reverting to the more genuine research that involves starting with a question, scientists are applying a method to answer the question, conducting investigation and come up with an answer. In addition, the conflict of interest situation surrounding government officials concerned must be clarified. An important question is how the microbial work model has been able to occur [19, 22]? The model has basic scientific shortcomings, as the model does not take basic parameters into account, for the model's construction. Probably there are a lot of explanation from the use of new methods, structures and materials, which are not always entirely suitable for the climatic condition prevailing in Sweden. An important example is the roof construction, where Sweden with its climate requires structures that can withstand the precipitation that occurs and the climate changes that are prevailing. Historically, the ceiling design consisted of roofing with the sufficient slope and with minimum possible resistance for rainfall and snow to continue fall down to the ground. In addition, to protect underlying homes, most of the top floors were an attic and that means that when leakage occurred, they could be quite easily located and remedied. However, a change has been done, the required slope and surface layer materials who´s have been used earlier, don´t have the same quality today. This has made the moisture leakage become more common, comprehensive microbial growth on building materials often takes place and is much more difficult than before to find and solve. Today the attic is usually missing, as new buildings are not constructed with this and in existing buildings more and more will be furnished. The consequence is that the roof structure has been changed, and in the design important elements have disappeared. This lead to repercussions, not at least in the context of when leakage occurs. The new roof constructions mean that it is not the same protection system for housing during these roof constructions. That's means reside in leakage affected environments, many times with extensive microbial fouling, is unpleasant. This is an extensive problem in Sweden, but " a technical problem" and to indicate links to health problems should be done with utmost caution, as there are no scientifically support for the health linked hypothesis, as authorities allege [12, 13, 15 and 22]. The result of this has created for a flawed model to be used. In addition, with this model

a) it is not possible to identify many of the real problems that exist in buildings,

b) it often gives a wrong picture of the issue and

c) it frighten many of those who live in buildings [37].

For Sweden it is a big issue, if the authorities really live up to that the government have ordered them to do, with the environmental reporting, which is as follows;

- to provide a basis for setting priorities, which factors in the indoor environment that has meaning and
- to be a basis for a decision to promote a great development from a health perspective.

The situation is serious for a society from a public health perspective and work should continue to focus on creating better clarity in the relationship of authority and

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shortcomings must be rectified. For the area of the indoor environment in non-industrial buildings, building structures must be designed better suited to the climatic conditions prevailing in Sweden, not at least microbial and when moisture problems occur it is important to ensure that effective working models will be used.

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