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Reduction of autistic traits following dietary intervention and elimination of exposure to environmental substances

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Autism, environment, symptoms, food, exposure, obsession, behavior, clean-room, sniffing, breath, body fluids, molds, volatile organic compounds

Abstract:

Effects of environmental exposure were isolated and studied in 49 autistic children. Elimination of food-related reactions entirely allowed effects of environmental chemicals to be thoroughly studied indefinitely in the absence of food-related symptoms. Initially unaffected by social contexts, the autistic subjects acted out the ways they were affected by their environment without the altering effects of societal influences; and severity of the adverse effects made observation and study easier. There was a strong correlation ($P < .000$) between environmental exposure levels and autistic symptoms and behaviors. There appeared to be nothing inherently wrong with autistic children studied. Based on the results of the present study, a broad spectrum of severe and chronic autistic symptoms appear to be environmentally based, apparently caused by chronic exposure to volatile organic compounds, and appear to be fully reversible in the proper environment.

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Introduction:

The present research program traces its origin back more than 20 years to an in-house study at ASTi involving dietary intervention food trials. In the study, although unexpected, strong symptoms were observed and repeatedly associated with non-food environmental exposures. This early study was broadened to include a study of the non-food symptoms resulting from environmental exposures. A second in house research effort was also begun whose goal was to develop a dietary approach that would fully eliminate food related symptoms so that symptoms associated with other environmental exposures could be isolated and observed for long periods of time.

An effective rotation diet of unusual tropical root crops and other unusual foods was developed. This diet was found to quickly eliminate food-related symptoms of subjects while providing optimal nourishment. The diet has been used successfully to study the symptom changes associated with sequential removal of environmental exposures over long periods of time (3-12 months per person) in approximately 1000 individuals. The results reported herein were possible to obtain because symptoms caused by diet were consistently and completely eliminated from the symptom array in all subjects studied (Slimak 2001, 2002).

Method:

49 children, ages 2-17 with diagnoses ranging from severe autism to PDD were each studied for periods ranging from 3 to 12 months. Initial autistic and physical symptoms and complaints were rated (0-10) and again at weekly intervals after the subjects entered the program. Each subject was placed on the diet described above. Three environmental avoidance approaches were employed to study the role of environmental chemicals in autistic children. In Group I (14 subjects) there was no initial environmental avoidance; in Group II (27 subjects) there was moderate initial environmental avoidance, and in Group III (8 subjects) there was complete environmental avoidance using a clean room. After parents of subjects in Groups I and II, began to observe and report symptoms associated with environmental exposures, the parents were directed to begin sequential removal of items associated with exposure during weeks 3-52 of the program. This provided the opportunity to observe the symptom fluctuations that occurred as environmental exposures were eliminated sequentially. Trained volunteers (primarily parents and other family members) observed the children closely between 20-60 hours weekly in the home. This made it possible to extend periods of time for data collection, and many additional data points were obtained in a naturalistic setting. In weekly meetings between each parent and staff, details of observations were discussed, and symptom assessments, environmental implementation evaluations and problem solving assessments were conducted. Separately, environmental exposure was rated, as a single blind study. A group of 18 non-autistic children diagnosed with food allergies and chemical sensitivities were also studied in the program; these children also followed the above protocol: Group I, 4 subjects, Group II, 10 subjects, Group III, 4 subjects.

Results:

In Groups I and II it was possible to separate symptoms associated with foods from symptoms associated with non-food, environmental exposures, Table 1.

In Groups I and II, during sequential removal of items associated with environmental exposures, unanticipated actions were observed in the autistic children studied. These included: 1) autistic children

Table 1. Food-related symptoms vs. symptoms associated with environmental exposures.

	Food-related	Environmental exposure-related
Digestive symptoms	67%	23%
Other physical symptoms	50%	50%
Neurological symptoms	15%	85%

were consistently observed hoarding or attempting to hide scented items, 2) many cycles of reduced symptoms (following object removal) and increased symptoms (following selection of a new item) were observed.

Fig.1 presents results obtained for sensory sensitivity between weeks 14 and 40. The seven points at which symptoms associated with sensory sensitivity dropped to 'zero' followed the removal of an object of obsession or elimination of an obvious source of exposure. Between weeks 14 and 40, the seven peaks showing increased symptoms occurred immediately after the child selected and began obsessing with a new object. This pattern of symptom fluctuation was consistently observed in Groups I and II for all symptom categories except for muscle weakness and low muscle tone.

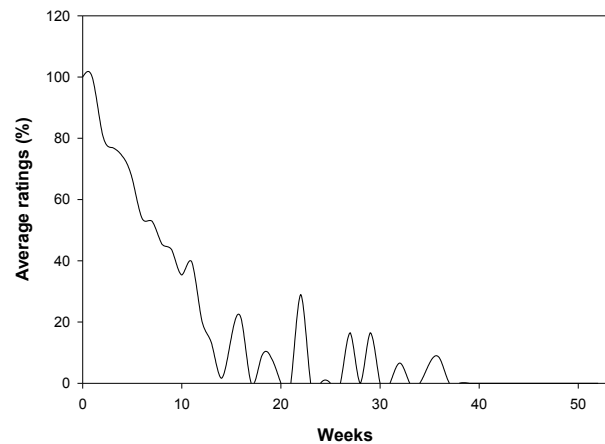
To study symptom fluctuations and obsessive behaviors further, parents of children in Groups I and II were instructed to 1) allow their children to continue obsessive interactions with objects without interference, and 2) change the object to prevent exposure to volatile organic compounds without the child's knowledge. For example, carbon filters were surreptitiously installed on tap water lines for obsessive toilet flushers; and sand was carefully cleaned for obsessive sifters.

It was found that the children would begin to interact with the object as usual and then would stop within moments with a very confused, perplexed facial expression. They would examine the object, smell it, look at the item again, smell it again, and put the object down. This process was repeated with decreasing frequency as the children lost interest in the object; the behavior was spontaneously extinguished in time periods ranging from 1 day to 10 weeks. Table 2 presents a partial list of obsessive/compulsive behaviors studied. In the absence of environmental exposures, no obsessive behavior continued in the subjects studied.

Table 2. Obsessive, compulsive behaviors eliminated following surreptitious removal of scent components.

sifting	hand washing	hand wringing	TV/video obsessions
lining	hair smelling	face slapping	door closing and shutting
pica	toilet flushing	stick picking up	toy smelling

Fig 1. Fluctuations in sensory sensitivity occurring during cycles of obsessive interaction with objects, removal of said objects, and child selection of a substitute.



As a result of these observations, it became apparent that effects associated with chemical exposure were much greater than initially anticipated. The study was expanded to include a study of a group of children in clean rooms (Group III).

Figure 2 presents the overall symptom reduction achieved by subjects on the program. In Groups I and II strong determined seeking behaviors described above complicated the process and increased the time necessary to achieve a suitably clean environment in which no symptoms were present. Group III, with the reliance on a clean room, while much faster, still did not provide the rapid plummet of symptoms to '0' that was expected. As is illustrated in Fig. 3, it was found that the seeking behaviors continued in the clean room and, finally, included resorting to use of breath and body fluids, when nothing else was available. This enabled the subjects to continue exposures and reactions for several weeks longer than expected.

After a few days in the clean room, the children's sense of smell appeared to become particularly acute. They were observed sniffing the air and following micro scent plumes to a source, such as a tiny point in the wall of the clean room, where the seal was not intact. The children were observed behaving as if strongly attracted to the highly diluted tails of micro-plumes estimated to be 100-1000 times below the ppt (part per trillion) level in the clean rooms, and following these micro-plumes to their more highly concentrated source. The children were observed returning to the point source where the hair-thin plumes were most highly concentrated, and sniffing briefly several times each day. The symptom levels increased as is shown in Fig. 3 until the areas were sealed, after which time the symptom levels again dropped rapidly.

Fig. 2 Overall symptom reduction in autistic children achieved with diet and avoidance of environmental chemicals

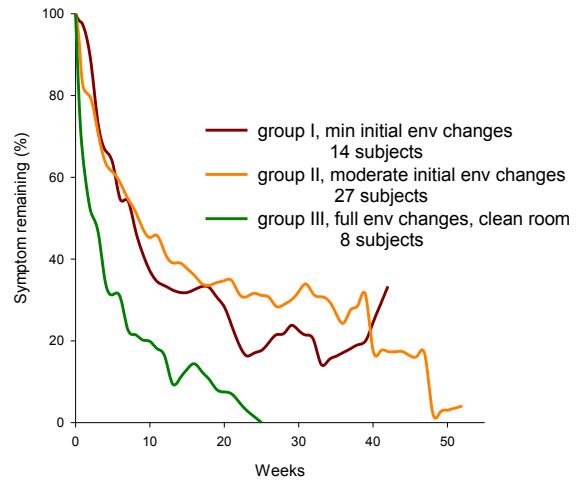
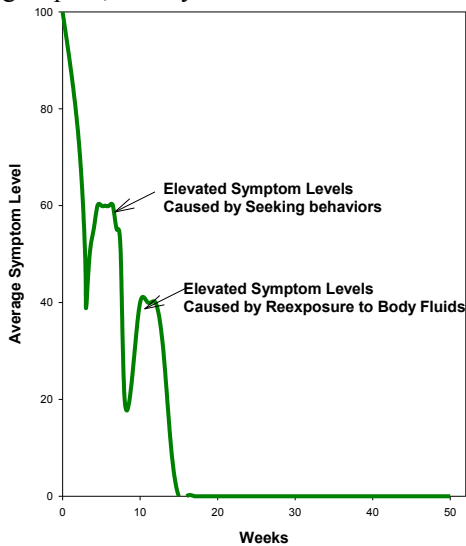


Fig 3. Unanticipated behaviors observed with children in group III, dietary intervention and clean room



After micro-plumes from pinpoint sources were eliminated, a new problem was observed. Children began sucking on clothing, making 'tents' of bedding, and the like, and emerging with glassy stares, disconnected behaviors, and again with elevated symptom levels. This was addressed by requiring subjects, and caregivers to switch to clothing and materials whose pristine nature matched the ppt and ppq levels needed. Many of these items have had to be developed in our program. The change to pristine materials was the final change necessary to eliminate the surge of symptoms associated with seeking behaviors that had been occurring between weeks 4-10, Fig. 3.

After the clean rooms were sealed and materials inside the rooms were sufficiently pristine, autistic children in the clean rooms became frantic. The children abruptly became

disinterested in objects (now pristine) and became very interested in their bodies and body fluids. Although obsessing with body parts and body fluids occurs in some autistic children, this behavior was not found in the subjects prior to the study. For a period of several weeks the autistic children in the clean rooms of the present study were observed consistently and purposefully manipulating their breath and body fluids.

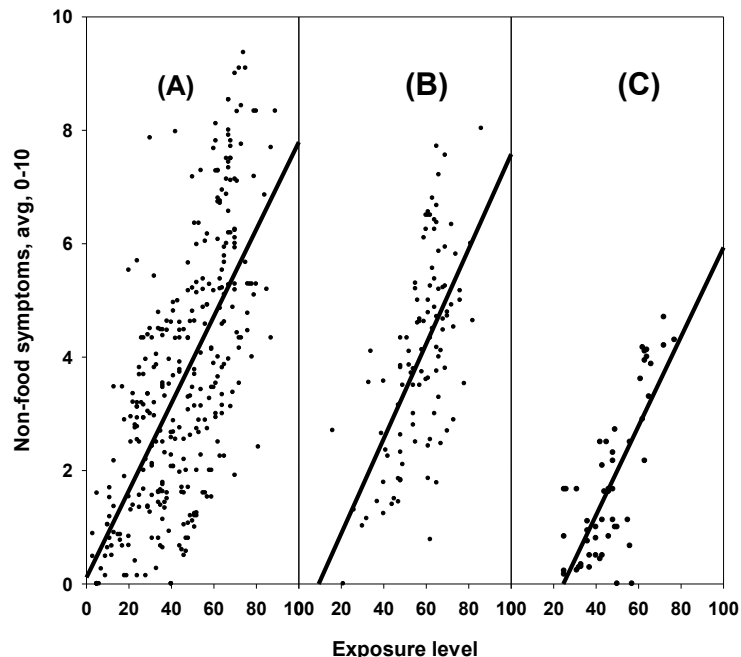
Although the children in the study did not try to find a way out of the room, the children were consistently observed trying desperately to recreate a polluted environment in the room. In the pristine clean room autistic children have been routinely observed: 1) with hands to face in a corner, ‘huffing’ their own breath, 2) holding hands over mouth and nose to trap and rebreathe breath, 3) standing on their heads to allow their shirts to fall over their faces and trap their breath, 4) spreading saliva over arms, legs, hair, body, 5) spreading saliva in thin layers over walls, floors, and windows, 6) urinating behind furniture where mold will easily grow, 7) urinating on floor and running through the urine repeatedly to spread it thinly throughout the room, 7) spreading saliva, urine, or stool onto wood and any porous material available, 8) placing hands inside pants and then wiping hands on walls, floor or self, and 9) spreading body fluids in as many cracks and crevices as possible to promote mold growth. New procedures have had to be developed to eliminate or prevent the above-described problems. For each child, as soon as this final type of exposure was eliminated, the symptoms were fully eliminated.

Figure 4 compares non-food symptom levels and environmental exposure levels, revealing a strong predictable correlation that cannot be explained by chance alone. For subjects with most severe symptoms (A), adj R sq = 0.581, for moderate (B), adj R sq = 0.385. For mild (C), adj R sq = 0.454. The analysis of variance of the regression model shows that the exposure levels were a significant ($P < .000$) predictor of symptoms of the subjects studied. Thus, there is little doubt that the relationship of exposure levels to symptoms is not due to chance alone. These data reveal a convincing and predictable pattern.

Because the regression curves cross the x-axis (B, C) or intersect at the origin (A), the data show non-food symptoms were fully eliminated by eliminating the remaining environmental exposures. Because the slopes of A, B, and C linear regressions are essentially the same, comprehensive initial symptom rankings may have predictive value, particularly in indicating early the extent of environmental cleanup that is likely to be necessary.

Especially for children in Group III, the older, severely autistic group, after achieving the zero symptom level, a difference was observed between a) physical and behavioral recovery and b) emotional maturity and educational age. The subjects tended to quickly achieve age appropriate physical skills, abilities and temperament coinciding with normal health, however in terms of learned behaviors, the children have tended to behave as if the years they ‘lost’ to autism never happened. The subjects have been able to learn quickly, eagerly, and with apparent ease, beginning again from the place in time that they became autistic.

Figure 4. Comparing non-food symptom levels to environmental exposure in children with autism and PDD, grouped according to severity; (A) severe, 23; (B) moderate, 14; (C) mild; 4



Conclusions:

- The present study has described a method for long-term study of autism and other chronic conditions.
- Elimination of food-related reactions entirely and indefinitely allowed effects of environmental chemicals to be thoroughly studied without other complicating symptoms present.
- Clean rooms established in homes were an important tool for conducting long term studies that maintained full symptom relief for 12 months and longer through complete, sustained elimination of dietary symptoms and sustained elimination of environmental exposures to levels as low as ppq. Added advantages included social contacts in comfort of home and family, and reduced cost.
- It was important to study autistic children as a group, rather than limiting the study to an allergic subset.
- Autistic children proved to be a particularly appropriate group for research study and observation. Initially unaffected by social contexts, the autistic subjects acted out the ways they were affected by their environment without the altering effects of societal influences; and severity of the adverse effects made observation and study easier.
- There appeared to be nothing inherently wrong with autistic children studied. The children in the program (universal diet and clean room) returned to normal physically, in temperament, in awareness of surroundings and others, in emotions and empathy, and in ability to learn. The children were, however, initially deficit in learned behaviors and skills that must be taught; apparently in these areas they had remained at the level present at the time of initial diagnosis of autism. In the present program, the autistic children demonstrated ability to rapidly and enthusiastically learn and begin catching up. Children began progressing through the normal stages of learning and social development in their clean rooms.
- Based on the results of the present study, a broad spectrum of severe and chronic autistic symptoms appear to be environmentally based, apparently caused by chronic exposure to volatile organic compounds, and appear to be fully reversible in the proper environment.
- There was a strong, predictable correlation between symptom levels and environmental exposures ($P < .000$).
- The results suggest strongly that the autistic condition of the children studied, was the result of chronic exposure to volatile organic compounds.
- It is difficult to stress adequately the importance of expanding autism research to include research on environmental factors such as constant exposure to an ever-changing milieu of volatile organic compounds.

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