

Was the sealed, chemical free Biosphere 2 an MCS haven?



The original Biosphere 2 experiment created a sealed world free of pollution from pesticides, personal care products, exhaust gasses and toxic building products. Free of these poisons, the people inside noticed an increased intolerance to chemicals. Was this an MCS haven?

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A closed world

Biosphere 2 was an experiment to build an enclosed world where all the water, air and refuse was 100% recycled and all food was home grown without chemicals. The idea was to simulate a colony on Mars or in space. It had to be self-sustaining with food and it was not possible to open a window to bring in fresh air when

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needed. Pollution was no longer something that just "disappeared" somewhere else.

The Biosphere 2 was a glass-enclosed world consisting of several domes. The domes contained a miniature ocean, marsh, savannah, desert and rain forest. One dome contained fields to grow food. The total enclosed area was 3.15 acres (1.2 hectares).

The domes were completely sealed, so no air, water or animals could enter from the outside. Even the soil was sealed off by a floor of stainless steel plates underneath.

A modern "tight" house still has small leaks, so all the inside air is replaced with outside air within a couple of hours. Biosphere 2 was so tight that the air inside was not replaced even once in a year (Nelson, 2018).

Biosphere 2 was stocked with 4000 species of plants, insects, microbes and animals to form a complete ecosystem where the waste from one species was food for another. There was 30,000 tons of soil, with thirty different kinds of soil (Alling, 1993).



One of the Biosphere 2 domes.

The structures were completed in 1991. Then eight people moved in and stayed for two years without leaving or having visitors inside (they could visit with guests through a sealed glass wall). They lived on the food they grew themselves, breathed the oxygen generated by the plants, and drank recycled water. This crew was called biospherians.

Avoiding chemical pollution

Sick building syndrome was a known problem when Biosphere 2 was designed and built in the years up to 1991. The term is even used in their books (Alling, 1993).

The experiences from Skylab and other NASA space flights had demonstrated that toxic chemicals build up inside sealed spaces. A small version of Biosphere 2 also demonstrated the problem:

In the Russian Bios-3 experiment, even the plants stopped growing due to the toxic buildup (Alling, 1993).

The Biosphere 2 designers did their own experiments before building the structure:

Our experiments in the Test Module showed that even rigorously evaluated materials still produced some outgassing into the atmosphere (Alling, 1993).

The Biosphere 2 buildings were built of concrete, steel and glass. In the living quarters there was also wood and the carpets were made of natural wool. They avoided the toxic outgassing from many regular building products, such as synthetic carpets.

They realized that regular personal care products contained toxic chemicals that would eventually build up in their enclosed space. This was especially an issue with shampoos and detergents, which would end up in their water and food.

To put it bluntly, if we used a product that was not biodegradable, we would be drinking it in our tea within a week (Alling, 1993).

They searched far and wide for non-toxic alternatives (difficult in 1991) and found a small selection which were approved.

Anything containing fragrances was banned. If someone wanted to use a scent, they had to cut a leaf off a bush and rub it on their skin (Alling, 1993).

The food was grown organically with no herbicides, pesticides or synthetic fertilizer. Instead, there were many natural cycles built into the system. Kitchen scraps were given to the goats, the goat manure was fertilizer together with the materials they composted. Another example was their rice paddy, where a fern growing on the water was consumed by fish, which again fertilized the growing rice plants.

When they did have to fight pests, they used spray bottles with non-toxic dish detergent, BT (*Bacillus Thuringensis*) or manual labor.

They lived in a moist tropical climate with many kinds of insects. When their kitchen was invaded by hordes of insects, they removed them with a vacuum cleaner and fed them to their chickens (Nelson, 2018).

No gasoline, gas, paints, fragrances, cigarettes, glues or other toxic chemicals were allowed, except where totally unavoidable, such as for repairs on a leaky pipe.

We evaluated whether it was safe to release the trace gasses associated with cleaners, solvents, and glues. These discussions could get heated, but sometimes we had to wait until trace levels were lower (Nelson, 2018).

After the airlocks were closed they analyzed the inside air regularly for chemicals. They could detect small levels of construction solvents in the start, which slowly went down as the plants consumed them. But two chemicals were slowly rising. Finally they discovered a couple of PVC glue bottles that were not tightly closed. Then those gases also started to decline in the air tests (Nelson, 2018). Amazing so little can still show up in such a relatively large air space.

De-adaptation/unmasking

As people with MCS – and their healthy families – have noticed, living without fragrances and other chemicals heightens the sense of smell. Or rather, it restores it to its natural state. The medical world calls it de-adaptation, in the MCS community it is called unmasking.

The biospherians also noticed this effect, such as when their two-year stay ended and they re-entered the toxic world:

The speeches finished, we climbed aboard a golf cart to be driven to mission control for debriefing ... This one had a gasoline engine. Our broad smiles ... turned to disgust, inhaling those noxious exhaust fumes like everyone else! (Nelson, 2018).

Inside Biosphere 2, they had also noticed their heightened sense of smell:

I'm quite sure that blindfolded, all eight of us could tell which biome we were in by its distinctive smells and atmosphere (Nelson, 2018).

Like people with MCS have noticed, even subtle smells are absorbed by clothing and then slowly released, which people with their full sense of smell can readily pick up.

In the smell-conscious environment of the Biosphere, other crew members could always guess where you'd been when you came back to the dinner table (Alling, 1993).

Was Biosphere 2 an MCS heaven?

This author interviewed for a job at Biosphere 2. I Thought it might be a safe place to work, especially since it was located in an open desert that I felt much better in than in a city.



Inside the agricultural dome.

This was in the first years I had MCS and I hadn't yet found the physician who eventually diagnosed me. There was very little information to be found about the illness in the 1990s.

I told the people who interviewed me a little about my illness. They told me that the pollen levels inside the domes were sometimes extremely high. This was a few years after the human experiments ended and the job I applied for included servicing equipment inside the domes.

The air inside the domes was humid and smelled "earthy" like a poorly ventilated greenhouse. I wanted to move to Arizona to escape mold, pollen and terpenes, besides city air pollution, so Biosphere 2 was not the place for me, despite the excellent desert location and the consciousness there that toxic chemicals were not so wonderful.

The idea of a closed world is probably not feasible for people with MCS. The crews manning Biosphere 2 were extraordinary people, who were willing to forgo many conveniences to participate in this amazing experiment. As we with MCS are often painfully aware, many people will resent and rebel against rules that do not directly benefit themselves, even if it saves other people from suffering. This is seldomly done in evil, but justified by various rationalizations, such as "it's just a little bit."

The media frenzy

The media was fascinated by the human story of Biosphere 2, but it oversimplified and hyped everything.

It's weird how some American media were fascinated whether there would be a baby born inside. I recall one testy answer: "We are modern women and can practice birth control. We have plenty of work as it is." (Nelson, 2018).

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Some journalists crucified the management in the public press, treating the project as if it was an Olympic contest to see how much could be done without opening the doors (professor H.T. Odum, quoted in Nelson, 2018).

The media sometimes made up things entirely, perhaps by misinterpreting what they saw through the windows. One reported that the biospherians washed their clothes in one of the streams (they had washing machines). A well-regarded magazine erroneously reported that all the fish were dying and were retrieved daily by the crew (Nelson, 2018).

To this day, people commonly think Biosphere 2 was simply about whether eight people could survive a trip to Mars – and that the experiment failed. Neither is true. Biosphere 2 was such a pioneering endeavor it is amazing so little actually did go wrong.

We in the environmental illness community have also seen how the media can create stories that are wildly inaccurate.

Results of the experiment

Biosphere 2 allowed scientists to study complex life processes that could not be studied anywhere else. They collaborated with scientists from many universities and even hosted scientific conferences via video link or through the glass wall.

Some of the studies were an early look at how the increasing levels of carbon dioxide in the earth's atmosphere affect plants.

The problems facing the biospherians also provided valuable information. They fought various pests, such as cockroaches, mites, mildew and mice. Since they could not use toxic chemicals they had to be creative.

To their surprise, the oxygen level kept falling so it eventually was as if they were living a 14,000 ft. (4500 meters) elevation, and had to get oxygen shipped in. They finally discovered that the oxygen was absorbed by the concrete through a chemical reaction, which was fixed for the second experiment.

The agricultural area was too small to comfortably feed eight people, but they made it through on a reduced diet, which made them all lose a lot of weight.

One of the studies monitored the biospherians' blood levels of pesticides. Even though they lived without pesticides, their blood levels went up dramatically because they were metabolizing their own stored fat deposits, which brought out the pesticides stored there over many years (Walford, 1999).

Prior to the start of the human experiment, a large engineering effort was required to design the mechanical support systems that filled the basement under Biosphere 2. Another large effort was to identify and gather the many species of plants, insects and animals needed to create a living biosphere. Both of these efforts were successful beyond expectations.

Much was learned from the Biosphere 2 experiments, and some are being used to restore damaged ecosystems or build ecological waste handling systems. Nelson

(2018) describes some of these, as well as the technologies developed for Biosphere 2.

What later happened

Two crews lived in Biosphere 2. The first stayed inside for two full years, as planned. The second for just six months.

Biosphere 2 cost \$150 million to build and was financed by a visionary Texas billionaire. When the management of the facility was later in turmoil, Columbia University took over operating the place and the focus changed to other science projects without people living inside. Eventually University of Arizona purchased Biosphere 2 and continue to use it for science.

A much smaller version of Biosphere 2 was built in China in 2017. Named YueGong-1 (Lunar Palace 1) it was 160 square meters (1600 sq. ft.) and has already hosted a crew of eight for 370 days. It was more efficient in growing food by using the newer vertical farming technology.

More information

Other stories and information about MCS are available on: www.eiwellspring.org.

Sources and references

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The photos were all taken by this author during his visit in 1997.