Honey Bees; Implementing Hospital Hygiene

by

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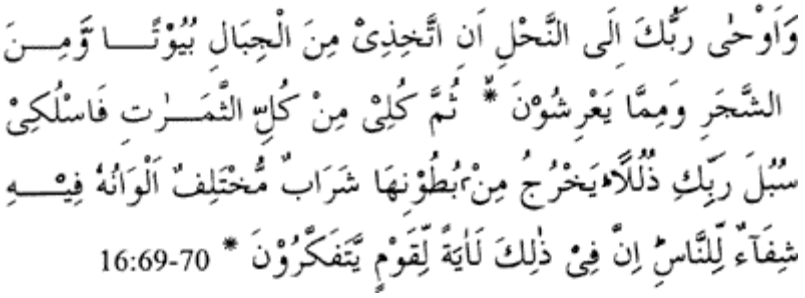
The Holy Quran


وَاَوْحٰى رَبُّكَ اِلَى النَّحْلِ اَنِ اتَّخِذِيْ مِنَ الْجِبَالِ بُيُوْتًا وَّمِنَ
الشَّجَرِ وَمِمَّا يَعْرِشُوْنَ * ثُمَّ كُلِيْ مِنْ كُلِّ الثَّمَرٰتِ فَاسْلُكِيْ
سُبُلَ رَبِّكِ ذُلُلًا يَخْرُجُ مِنْۢ بُطُوْنِهَا شَرَابٌ مُّخْتَلِفٌ اَلْوَانُهٗ فِيْهِ
شِفَآءٌ لِّلنَّاسِ اِنَّ فِيْ ذٰلِكَ لَاٰيَةً لِّقَوْمٍ يَّتَفَكَّرُوْنَ * 16:69-70

> And thy Lord has inspired the Bee, saying, 'make thou houses in the hills and in the trees and in the trellises which they build. They eat of every kind of fruit, and follow the ways of the Lord that have been made easy for thee. There comes forth from their bellies a drink of varying hues. Therein is cure for men. Surely, in that is a sign for a people who reflect.' [1]

The Bible

Psalm 81:16

But you would be fed with the finest of wheat; with honey from the rock I would satisfy you.

Ezekiel 16:19

Also the food I provided for you – the fine flour, olive oil and honey I gave you to eat – [2]

Introduction

Hospital hygiene is an essential area for smooth functioning of any medical facility. Studying the manner in which honey Bees hygienically administrator and maintain themselves and honey combs, would put any modern hospital to shame. As such they have a lot to teach us. The key is that the health care providers should be clean and tidy.

The article will focus on hospital hygiene, implementing honey Bee practices of hygiene and management, thus getting lessons from their life style. This is a great step in decreasing the chances of contamination or infection within a hospital.

Construction

Construction of the hives is an important task which is undertaken by the young Bees. The comb itself is one of the marvels of animal architecture. It consists of a regular back-to-back array of hexagonal cells, arranged in parallel series; each comb has a precise distance from each other. The Beehive's internal structure is a densely-packed matrix of hexagonal cells made of Beeswax, called a honeycomb. The Bees use the cells to store food (honey and pollen) and to house the "brood" (eggs, larvae, and pupae).

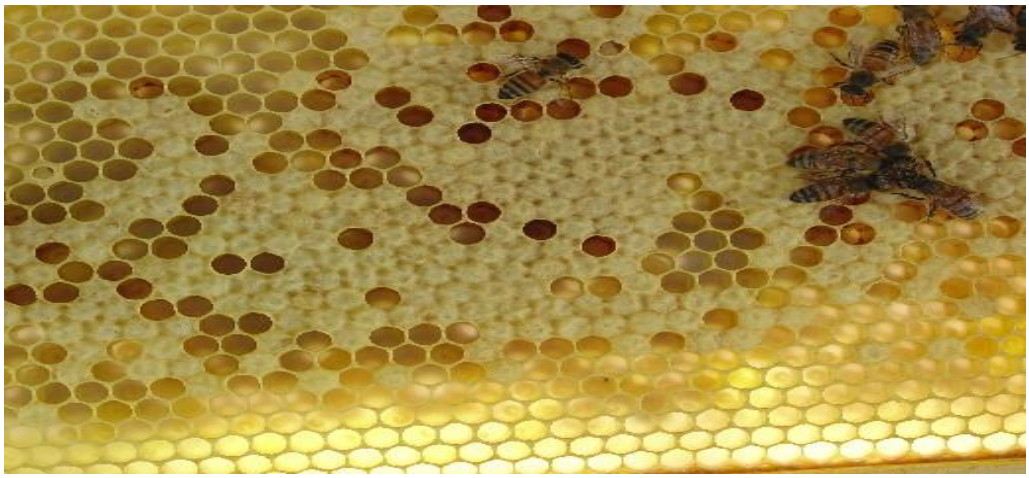


Figure 8: Bee hive a marvel of engineering and construction

Bees display fantastic engineering skills and their building gives the impression that they have been equipped with most sophisticated measuring instruments. Bees make their hive in a place that is suitable for their requirements. They will select place in shelter so that the hive remains cool in summer. Place at height, with proper ventilation would be selected so that they are safe from predators and honey thieves.

Figure 9: Hives made by honey Bees in a suitable place.

The Bees often smooth the bark surrounding the hive entrance and the cavity walls are coated with a thin layer of propolis. Every Bee that leaves the hive has to place its foot on the propolis and disinfect them before entering the hive. The basic architecture for combs is; honey is stored in the upper part of the comb, beneath it are rows of pollen-storage cells, worker-brood cells, and drone-brood cells, in that order. The peanut-shaped queen cells are normally built at the lower edge of the comb.

The cells of the honey Bees have been studied massively due to their complex and superb geometry and shape. Bees built their cells in a hexagonal structure with trihedral ends. The hexagon shape tiles the plane with minimal surface area. Thus, a hexagonal structure uses the least material to create a lattice of cells within a given volume. Cells are also angled up about 13° from horizontal to prevent honey from dripping out. [3]

Figure 10: Neat and clean hexagonal cells filled with honey

While designing a hospital, special emphasis must be on the selection of a proper place that has minimal pollution and dust. Building structure should be designed in a way to take maximum advantage from available space. Each and every part of a hospital must be designed in a way that dust and debris can be cleaned easily. Hence, it will be easier for sanitation staff to clean the hospital easily and properly. As the Bees spread antiseptic resins over the hive, hospital building should be coated with paints or substances that contain antibacterial material. Anti termites procedures must be adapted, fly proof measures, mosquito repellents and rodents must be kept away using various sanitation measures.

Entrance and Security

Honey Bees have very effective sensors, they can judge very accurately if anything that is entering the hive is or not a member of the hive. They can also recognize honey Bees which are from other hives by their smell and scent. If a honey Bee from another hive attempts to enter the hive it is not allowed to enter the hive. All hives have specific smell and any stranger honey Bee is recognized easily. [4]

Figure 3: Hive entrance

The honey Bees make their entrances in a very systematic way. When they build the hive, the entire comb is pasted with a material called propolis. Propolis is a natural antibacterial which help resist diseases. It is also pasted on the rims and entrances of the hive and whenever a Bee enters the hive, it first steps on the rim containing propolis then enters the hive. By stepping on the rim containing propolis all the bacteria on the tiny feet are killed and destroyed. Hence, the Bees enter the hive after proper cleanliness. [5]

Hospital entrances and security should be well organized and managed. Every person must be checked properly with metal detectors etc and proper security procedures must be taken. Some special security measures must also be adopted for emergency situations. Security personnel should be well trained, practically and mentally. They must perform the duties properly because the responsibility of the safety of all others is upon them. This attribute is common in a honey Bee so why not in a human.

Figure 4: Hive security; honey Bees attacking outsiders.

At the entrances of the hospital special measures must be taken to ensure that maximum germs can be kept out thus making the hospital hygienic. For this a high antiseptic air pressure mechanism can be installed on the entrances. Mats can be placed which can absorb dirt and germs when a foot gets in touch with them. Implementation of modern hygienic techniques is very important to make hospital free from contamination and infection.

Figure 5: Honey Bees are coating the hive with propolis.

Rooms and Wards

Honey Bees can also detect if any brood gets diseased. They immediately uncap it and remove it from the hive, before the diseased brood gets infectious. [6] The larva of the honey Bee is a greedy eater. In just few days it is visited and fed about 10,000 times. [7] Finally, when the honey Bee emerges from the cell, the remains are left behind, known as cocoons. The Bee emerged, is very responsible from the beginning, it immediately starts cleaning the cell before the queen lays another egg.

In hospitals, rooms and wards are ‘cells’ for patients. Wards must be well taken care of and nurses must visit the patients frequently. For ward hygiene, the sanitation staff must be well trained and fully equipped so that they can perform their duties properly. The nurses also have to be cautious and vigilant about patient care. They must be active and frequently visit the patients. The area around a patient’s bed needs particular attention. Bed sheets, dustbins, patient uniform etc must be changed frequently. Cleaning of the wards and equipments with proper antibacterial and antiseptics is obligatory to ensure hospital hygiene and patient’s safety.

Figure 6: Crystal clean and hygienic cells.

The most sensitive areas like operation theaters, labs, wards and the intensive care units should be well above the ground to get rid of external pollution. Another thing that must be kept in mind is that the edges of the operation theaters must be curved so that they can be cleaned easily and bacterial growth is minimized. Even the walls and corners should not be ignored and must be cleaned periodically and coated with anti bacterial paint. The kitchen, toilet and laundry need special attention as well.

Ventilation/ Air Circle

Honey Bees have a proper ventilation system. They can maintain a proper temperature of hives between 30° to 35°C. If the external temperature is hot, they counter this problem by fanning their wings, which creates air circulation currents in the hive and effectively moving fresh air in the hive thus decreasing the temperature. If the external temperature is cold, they stay warm by clustering together in the middle of hive at the top of the comb. Then they contract their pectoral muscles, which in result produces heat. This is how honey Bees maintain the temperature at 34°C during winter. In addition to fanning, they haul water instead of nectar into the honeycomb and deposit it around the cells, which contain larvae sensitive to heat.

Hospitals should aim at the proper ventilation structure. Ventilation ducts should be neat and maintained properly. Temperature should be maintained constant and antiseptic filters should be installed in every air entrance of the hospital. Air should be frequently exhausted from the hospital so that fresh air could take its place. This is especially important for operation theaters and crowded areas of the hospital.

Personal Hygiene

Honey Bees are very attentive about their personal cleanliness. They do many chores to keep their bodies and hive clean and free from debris bacteria etc. Their body parts are specifically designed to help them stay clean, including variety of bristles on their limbs that they use to clean body parts, such as mouth, proboscis and antenna. If the antennae or eyes are soiled, their sensors may not work properly, and that would be detrimental to the entire colony, hence putting them and the hive to risk. After foraging and before flying to home, honey Bee will clean its eyes with its forelegs and also clean their antenna by pulling it through special notch.

Figure 1: Honey Bee cleaning itself.

Grooming is also very commonly seen among honey Bees. [8]

Figure 2: Honey Bees grooming each other.

Similarly, hospital staff must be very responsible concerning their personal hygiene. Staff personnel that are in contact with patients must follow modern hygienic practices. A doctor being the most literate and civilized person in a hospital must be a role model for other staff members. Clothes, uniforms, gloves etc should be clean and tidy and must be changed after every surgical and medical activity. Instruments that are used for operations and other activities must be sterilized. A doctor should frequently use disinfectant to ensure his and patients safety.

Humans are also gifted with such body parts to keep themselves clean. The most important thing to keep in mind is the role of grooming and making people aware about hospital hygiene and its significance. Different seminars and lectures must be conducted to make people aware and to motivate them towards this good act of keeping a hospital hygienically clean. (Grooming)

Medicines

Honey is being used as a natural medication since ancient times. Its acidic nature makes it antiseptic and its super saturated structure makes it the least desirable substance for any bacteria to survive. On the other hand honey Bee layers the hive with an antiseptic substance known as ‘propolis’. Propolis is a resin that the Bees collect from different trees while hunting for nectar. It is also used in herbal medication for the treatment of infections. Honey has an osmotic effect. Honey is primarily a saturated mixture of two mono saccharides, with a low water activity; most of the water molecules are associated with the sugars and few remain available for microorganisms, so it is a poor environment for their growth. [9] If water is mixed with honey, it loses its low water activity, and therefore no longer possesses this antimicrobial property.

Figure 11: honey Bee layering the hive with Propolis (Natural anti-bacterial).

Similarly, the best medicines must be available in the hospital at all the time. Infected patients should be isolated. While dispensing medicines strict principals must be followed. It is also obligatory that medicines should be procured from reputed and reliable manufacturing facilities.

Interaction

For each drop of honey thus created, they have to make repeated sorties to the field in search of nectar and this goes on day in and day out. Bees interact with one another in such a way that they are well aware of the needs and wants and that a Bee at one corner of the hive knows about the needs of the entire colony. When a foraging Bee returns to the hive with a load of nectar, another worker takes the nectar from her.

A hungry Bee approaches a sister Bee and places her proboscis into the sister's mouth, so that the hungry Bee can ingest it from inside her mouth. [10]

Figure 12: Honey Bee interaction by sharing food.

Entire colony of some eighty thousand individuals is the queens' subjects. No better discipline can ever be displayed by human kingdom.

Similarly, in hospitals frequent interaction of departments is very important. This will improve the efficiency and smooth functioning of the hospital and hence better care of the patients. Also this will keep them motivated and helpful at the same time. Administration is responsible for arranging platforms to keep the staff attached. Seminars and courses should be arranged for the staff so that they can learn from others and be more helpful for the cause.

Administration

In Bees after a specific time period some glands cease and stop to function effectively. The reason for this is that for every task days are fixed. Same is with wax production glands. They will work effectively when the Bees reach to wax production age. Before this age they cannot produce wax, and they will cease to function when that age is passed. [11] The queen honey Bee is actually the one in power and she controls and reigns over the hive. The queen is always surrounded by attendants; she is fed with a rich food known as ‘royal jelly’. This protocol is because she is responsible to perform some crucial tasks in the hive. Queen Bee secretes pheromones and chemical signals to worker Bees. These pheromones and chemical signals are significant to control many activities and behaviors. And above all it works as ‘social glue’, creating a strong bond keeping Bees together. [12]

Figure 7: The queen supervising the hive and being attended by workers.

Top management tier is like a honey Bee queen, especially the chief executive of a hospital must act like a queen and the rest of the staff must follow the chief as worker Bees follow the queen. This will indeed make all operations and tasks highly effective and efficient. Top management is responsible to provide employees with the motivation needed to run all tasks of a hospital proper and getting maximum output from them. They are in charge to provide that glue and bond needed for a strong team work. It is also the duty of the management to hire competent employees that can work for the betterment of a hospital. In simple words top management is the backbone for the smooth running of a hospital.

Distribution of labor is another important factor, it will definitely ease the employees and everyone will be responsible of their own work. Some employees should be prepared to perform all kind of tasks. An employee must be ready to do any work or task. Ego problems badly affect employee dedication. Employees must work for one objective under the management guidance and vision.

Hard Work and Determination

Bee starts working from the very moment when she takes first breath as a young Bee. She starts by cleaning the very cell from which she comes out. They quite literally work hard and even sacrifice their lives to ensure the survival of the colony. Bees divide their work according to the age. They normally have an age of 35 days. Young Bees are responsible to clean the hive, two days after they hatch. They have to nurse, take care of the queen and produce wax between next

3 to 10 days. Then the worker Bees help in processing nectar and guarding the hive. In the last 21 to 35 days of adult Bee works as a forager and a soldier. The last contribution an old worker Bee makes to the well being of the colony is to remove her from the hive before she dies. [13]

Figure 13: (a) Cleaning the cells and nursing the larva for first 2-10 days. (b) Producing wax and maintaining the hive. (c) Foraging and honey production.

Similarly in hospital environment, employees should work with full dedication and devotion. If an insect can be dedicating and hardworking to such an extent than we humans should be even more. Hospital staff must be passionately committed and show loyalty to their work. Special classes and seminars are necessary. Division of labor and imparting training to the juniors is mandatory. Similarly, for the betterment of the institute and better care of the patients dignity of labour must be stressed.

Divine Inspiration

Honey Bee performs all functions unconsciously. It does not do all tasks with a conscious control of mind. It is the honey Bee genes that supervise them what to do, genes instruct them to do all the jobs and they have no mind of their own. On the other hand, the Creator of the genes has a mind and it is He who has educated the genes. The genes simply work as they are guided. [14]

Hospital staff must also work in the same spirit. It should be reflected from their deeds that working for the patients is part of them. Serving the humanity is their foremost duty…

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