**Theory on Uses of Medicines and Types of Diseases/Infections**

Bacteria can be found anywhere and if not treated, they can harm living organisms. Below are some medicines used to treat bacteria and prevent overgrowth and/or maintain healthy growth levels in the water.

Lice are found to usually grow on walls and glasses of tanks. Common occurrences would also be on fishtails, sometimes the back of the body, and a head area especially goldfishes and Koifish. Lice will naturally start growing when dormant eggs from parasites lay their eggs to potentially grow throughout.

Treatment for lice would be chemically treated with Dimillin. Works by interfering with the development of a new chitin exoskeleton on lice (beginning stage) and their larvae. The exoskeleton is required to shed its bodily coverage every several times so when the next cycle is fed, the structure of the newly formed exoskeleton is not properly formed thus causing the larvae to die. The dosage should be about 0.03mg/L and the next dosage should only be given after 10-14 days from the day of use.

Alternative to use of medicine would be to use UltraViolet light. The recommended power source would be 60 watts. This is to not kill most of the good bacteria but mostly the bad ones. We can also manually scrub the tanks to remove the eggs which is why this is used as preventive maintenance but this will not remove 100% of the lice. Some suggestions I made were to use the disinfectant for sponges in the washing machine to water bath the tank to get rid of the dormant/eggs of the bad bacteria to prevent the growth of lice. It was mentioned that it can be done however the maintenance and timespan would use a lot of resources and besides, the PUB water supply contains chloramine so it would have already killed most of the dormant eggs and parasites.

We were supposed to disinfect the tank but because they lack manpower, they took the alternative, which is tap water that runs throughout like RAS. It contains a small ounce of chlorine which is at an acceptable range of below 0.1ppm-0.3ppm. We do not use sodium thiosulphate or any other water agents as the cost will be high.

CuSO4 treats fishes to different parasites. These parasites mainly cause flukes on the gills and skin of fish. However, some cons of using copper solutions cause depletion of oxygen levels, especially in copper-sensitive fishes (like invertebrates). It could also potentially kill beneficial bacteria. The recommended dosage would be < 1g of CuSO4. Hence, the dosage should be once/per week to avoid low oxygen.

Ammonia levels can tend to get high in packing water and if it is not treated, fishes may face ammonia burns while leading to loss of scales and an increase in stress level. Hence, we often use ammonia reducers/removers which aid in reducing heat and irritation on scales of fish. When fishes are stressed, they tend to release mucus-like substances from their gills which is why we would use silver pro.

Because of the mucus, oxygen may be low and increased physiological stress, this can lead to having listless - staying in one spot or fighting against each other for oxygen which is why we use a silver pro. This can reduce abrasions among themselves and can even help during transportation as transport may not be smooth sailing, making fishes bump into each other.

White spots are a common occurrence in fish in both freshwater and seawater. Freshwater white spots are commonly caused by ichthyophitirius multifiliis - a parasite that is highly contagious in water. For seawater white spots are cryptocaryon triptans - a species of ciliates that can be fatal if left untreated.

Fortunately, the treatment is widely available and the medicine would be to use OT. We could also salt bath the fish to treat the fish for white spots in the 30s. OT stands for oxytetracycline. They are used to treat bacterial infections and are most effective for common carps. It can also be used as an antibiotic.

Salt bathing fishes are quite commonly used before treating fish with any medication to reduce dosage and intake. They are normally used to treat white spots, black spots, and fungus which are all stress causes to fish. These stressors cause black marks on the scales of fish. The fungus starts from lesions and is infected by bacteria to grow which increases the chances of not healing.

Flukes are also common in fishes like goldfish and Koi fish. They are parasites that are caused by poor water conditions making fish reduce their immune system to fight off any parasites hence being more susceptible to infections. From there, parasites feed on fish skin to lay eggs and reproduce, especially when in warm temperatures. They are affected by infected gills and skin which can potentially suffocate the fish if the growth of eggs is too big for them. A way to treat flukes is by using a prime ingredient called formalin. It contains antibacterial and antifungal properties to fight off and is most effective against fungal infection and external parasites of fish.

Some special diseases that only affect Koi fishes are called KHV - a viral disease commonly found in carps that are highly contagious and affects gills with color patches like brown/white, rough patches on the skin, and sloughing mucus. It cannot be treated and in the most common case, it would be culled to prevent overspreading. KHV can be detected through PCR (Polymerase Chain Reaction) and Serology testing. If the fish house is found to be tested positive for KHV in carps, NEA will take the necessary actions to prevent any more spreads of the virus and may need to suspend the fish house.

Acriflavine (A) is also used to treat a variety of ailments from bacterial/fungal infections to disinfecting open wounds in fish. It acts like a lotion, a topical antiseptic solution for minor wounds, burns, and infected skin. However, this may cause itchiness and painful burns upon contact.

The main purpose of FMG (Formaline Malachite Green and Methylene Blue) is purely to treat the external parasitic infection on fish commonly on koi fungus infections. It is a strong mixture that should only be applied after every week to prevent overdose.