



THERMUS AQUATICUS (TAQ): A SUPERFICIAL BACTERIA

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Introduction

Thermus aquaticus was first discovered in mushroom spring located in the lower Geyser Basin of Yellowstone National park, USA. Thomas D Brock and Hudson freeze from Indiana University isolated this bacterium from this hot spring that thrived at temperatures around 70°C. This discovery challenged the previous belief that bacteria could not survive above 55°C.

Characters

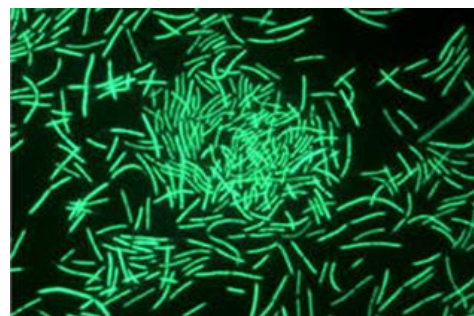
It is a thermophilic bacterium that can resist heat and survive at temperature around 95°C. Gram-negative, rod shaped or filamentous bacterium belongs to the Deinococcata and act as an obligate aerobe that scavenges proteins using numerous proteases. Produces yellow carotenoid pigment.

Isolation

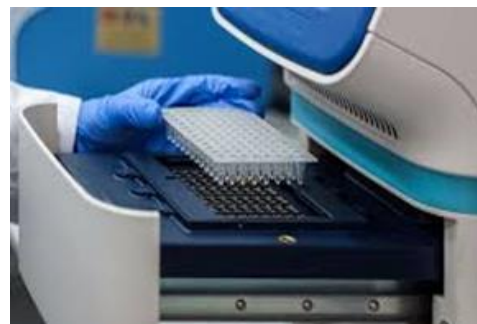
They collected water and sediment samples from hot spring with a unique way like they diluted the nutrient media and incubated at 70-75°C that showed growth of rod shaped bacterium with yellow pigment. Tryptone Yeast Extract (TYE) is used for faster growth.



a. Hot spring of Yellow stone



b. Thermus aquaticus



c. PCR

Significance in science

Thermus aquaticus provide Taq DNA polymerase, heat stable enzyme essential for Polymerase chain reaction (PCR) revolutionizing molecular biology.

Role in PCR

Taq polymerase functions during extension step at 72°C where it binds to primers annealed to denatured DNA templates. Taq adds nucleotides to polymerase activity. It is the key enzyme in PCR, enabling automated DNA amplification through its thermo stable properties.

Pre- Taq challenges

Early PCR relied on mesophilic polymerases like Klenow fragment from E.coli which denature at 95°C that required manual replacement after each cycle and it is labor-intensive.

Overall uses

- Amplifies specific DNA segments for cloning and sequencing
- Detect pathogens, genetic mutation
- Used in forensics like DNA fingerprinting and profiling

Conclusion

Without Taq polymerase in PCR reaction, no DNA amplification occurs because the extension step fails. Missing Taq results in zero net gain, rendering PCR useless for diagnostics or analysis. Hence forth, the tiny little organism plays an important role in molecular biology.