Characterisation of a novel bacterium in the genus *Streptomyces*

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Background

Bacteria contain a gene known as the 16s rRNA gene, which is relatively conserved within related species, with some differences due to random errors throughout evolution. Bacterial species are likely to be closely related when their 16s rRNA gene sequences have a similarity of 98%.

A bacteria isolated from soil in the Spanish Tabernas desert was found to have a low 16s rRNA similarity, suggesting it was a novel species that had yet to be characterised but was likely to be a *Streptomyces*.

Streptomyces are the source of 80% of antibiotics used today (Procopio et al. 2012). Therefore, confirmation that this newly discovered species is a *Streptomyces* could have important impacts on the production of new antibiotics.

Aims

To characterise the newly discovered AF1 using:

- Morphology - the appearance of the bacteria
- Physiology – ability to grow under different conditions (temperatures, pH levels, compounds etc.)
- Biochemistry – the cellular reactions and composition (enzymes, cell wall lipids, fatty acids etc.)

Approach

In order to characterise AF1, a series of tests were carried out to determine the morphological, physiological and biochemical features. These included:

Temperature range – incubating the inoculated plates at different temperatures to find the range and optimum
pH range – using buffer solutions to alter the pH of the agar AF1 was grown on, showing the growth range and optimum
Media growth – inoculating AF1 onto different media that contain different compounds to reveal which allowed growth
GEN iii microplate – 96 individual wells containing different compounds that result in positive or negative results for the oxidation of carbon sources and resistance to inhibitory compounds
API ZYM test – reveals the presence of different enzymes based on successful breakdown of substrates
Chemotaxonomy – determining the compounds found in the cells, including fatty acids, polar lipids, quinones and sugars.

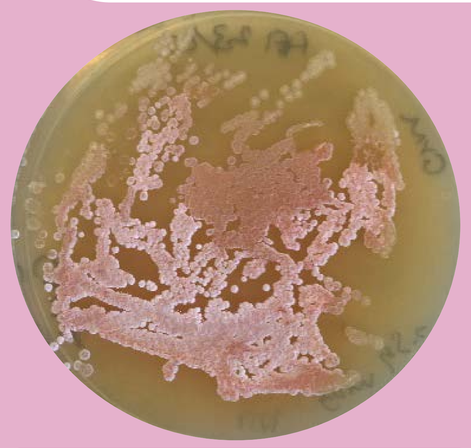

Figure 1. The typical colony appearance of AF1

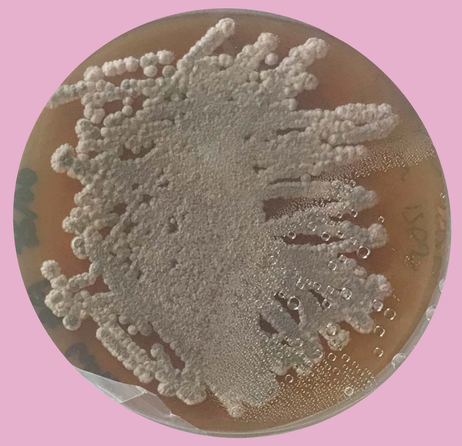

Figure 2. The appearance of AF1 on one of the different media

Results

AF1 was able to grow when incubated between 20-45°C, with the best growth achieved between 30-37°C. The bacteria was isolated from a desert, so the ability to grow at a range of temperatures and cope with high temperatures is expected. Additionally, the soil AF1 was isolated from is alkaline (a high pH) and the bacteria was found to be able to grow well on high pHs but poorly at lower (acidic) ones, as expected. It could also grow on all the *Streptomyces* specific media with different colony appearances on each type.

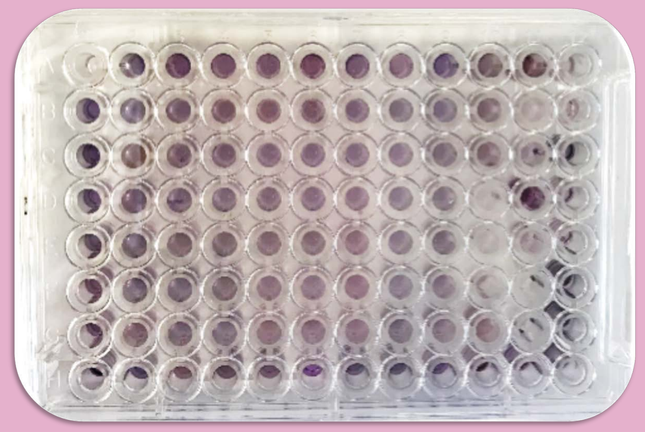

Figure 3. The results of the GEN iii microplate, showing which wells were positive or negative for growth of AF1

Conclusions

AF1 was found to have characteristics that were typical of *Streptomyces* while also showing differences that relate to its ability to survive in the harsh desert environment it was found in. While AF1 certainly shared many characteristics with *Streptomyces*, it may in fact belong to a previously unseen genus or family of bacteria due to the larger than expected genetic differences. This will be confirmed with further genome and 16s rRNA sequencing, but could contribute exciting new potential to the fight against antibiotic resistant bacteria.

Acknowledgements

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References

Procopio R, Reis da Silva I, Martins M, Lucio de Azevedo J, Magali de Arajo J (2012) Antibiotics produced by *Streptomyces*. Brazilian journal of infectious diseases 16: 466-471