

Uncovering the past to discover answers for the future

It is cold and damp, the stench of manure and soil cling to the air. Under a thatched roof, a physician fumbles between rows of glass tubes containing various concocted remedies. He turns, waving frantically, holding a vile containing a peculiar coloured liquid. He pronounces that this will treat the young man's troubled "wen". Some days pass and the young man returns to the physician, proudly announcing his eye has healed and the ailment has gone.

Fast forward 1000 years. Men and women alike, line up along the sides of a battle ground. Wooden sword in one hand, shield in the other. The sun is beating down and birds sing in the nearby trees, the dull knocks echo into the forest, as sword meets sword. Over refreshments, after a hard battle, the actors discuss what life must have been like in Anglo-Saxon Britain; sparking curiosity amongst a few. In particular a microbiologist wonders how infections from battle wounds were treated during this time, in the absence of medical and scientific knowledge.

Collaboration with the University of Nottingham Humanities department reveals an ancient physician's book which could provide the answers she has been searching for. In amongst the thousands of historical manuscripts, *Bald's Leechbook* sits, a collection of ancient antimicrobial remedies recorded within. A remedy is identified that appears to treat a sty of the eye, a common microbial infection of the eyelash follicle caused by *Staphylococcus Aureus*. The old English language is difficult to understand, however, a translation uncovers that various *Allium* species including garlic and leek are essential ingredients as well as some other irregular specimens including ox bile.

You might well be asking yourself why some ancient recipe would have a microbiologist so excited. The reason is simple; it could be the Holy Grail they've been desperately searching for. Antibiotic resistance is thriving. Over recent years scientists have been at a tug of war with bacteria, with each new antimicrobial development bacteria have fought back and evolved a new tactic for evasion. Scientists are particularly concerned with the growing bacterial resistance emerging against commonly used broad-spectrum antibiotics. Some which were once effective at eradicating infection

have been rendered completely ineffective against some bacterial strains. This is a worrying concept, as before the golden age of antibiotics, bacterial infections were responsible for high mortality rates in many countries. The phenomenon of resistance is a natural process which occurs in bacteria through the exchange of genes during replication or horizontal transfer between different bacterial strains and species. The use and misuse of many of these antibiotics has accelerated this process and as a result resistant strains have emerged sooner than predicted.

Infections caused by resistant bacterial strains are around 60% more deadly to humans than the non-resistant strains. MRSA (Methicillin-resistant *Staphylococcus aureus*) is one of the most significant examples, notorious for forming resilient bio-films on invasive hospital instruments. This strain of *Staphylococcus aureus* is lethal and can lead to severe blood poisoning and chronic wound infections in individuals. MRSA was previously a treatable infection, however, the prevalence of blood poisoning cases has increased dramatically from 4% to 37% throughout the 90's. Furthermore, this bacterial species has developed multi-drug resistance. VRSA (Vancomycin-resistant *Staphylococcus aureus*) emerged completely resistant to available antibiotics during the beginning of the millennium and has presented doctors and scientists with an even greater challenge.

You're probably wondering how this all comes back to the Anglo Saxon recipe, right? Interestingly, Harrison's research group recreated this 'ancient soup' in a laboratory setting to investigate its antimicrobial properties. To their surprise their experiments revealed that this 1000 year old concoction did in fact have the desired antimicrobial activity they had hoped for. Not only was the recipe successful at eliminating bacterial infections in cell culture, the same result was similarly achieved in an infected mouse model. The results found the "ancientbiotic" to be particularly potent against single cell and bio-film forming MRSA infections, for the group and microbiologists globally this is an exciting phenomenon which could provide a promising new direction for antimicrobial agents.

Harrison's team investigated the significance of each component within the ancient recipe; despite their scepticism they discovered that even the fortified wine was an essential ingredient! They further showed that the presence of all the original ingredients were vital in successfully killing the bacteria. But what's so special about some leek, garlic, oxgall and wine all tossed together and mixed in copper lined bowl? It sounds more like your grandma's special stew recipe! So what is it about these ingredients that bacteria don't like? These are the next questions Harrison and her team hope to explain.

The antibiotic era has hit its peak, and we are now embarking on a quest to find new antimicrobial agents in order to prevent bacterial infections launching a new defensive against mankind. However, no scientist could have imagined that the answers they were seeking could be concealed in ancient manuscripts. Perhaps now is the time to turn to the past for answers to the future...

