SECTION D

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Speciation of essential metals in wound fluids

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An important question in trace metal based wound management is bio availability of the metal ions. Complex forming species like amino acids, peptides, proteins, etc. are also numerous in biological materials. The total ligand concentration in the mammalian body greatly exceeds the metal content and so body tissues and fluids have been linked to arenas in which the various complexing agents compete for different kinds of metal ions, which are present.

In recent years, computer modeling studies (speciation) coupled with analytical methods have led to an increased understanding of the bioavailability of many metals with interesting conclusions. The distribution of essential metal ions amongst the complexes formed was simulated at three distinct pH values i.e. pH 6.4, pH 7.4, pH 8.4 for wound fluids during the healing cascade using a computer aided speciation program. To simulate the wound fluid, experimentally obtained concentrations of iron, zinc, copper manganese and calcium were utilized as total metal concentrations for post surgery day 1, day 3 and day 5.

The speciation analysis showed that the zinc complex with most number of low molecular mass (lmm) ligands in the wound fluid and also it is clear, when in neutral and alkaline pH conditions, the zinc complexation is higher. However the complexation during the healing of wound is more or less constant. Manganese complexes with more lmm ligands in alkaline conditions and also form high concentrations compared to low and neutral pH conditions. Iron complexes with citrate in high concentrations in spite of the acidity and the time of healing cascade. None of the other amino acids complexes with iron except valine. Calcium is in fairly high concentrations as a free metal in bio-fluids and speciation showed that the bioavailability of calcium is not a dependent of pH and the day of sampling. Copper complexes with wide range of lmm ligands in spite of the pH and the day of sampling. The highly formed complex is cu-glutamate and it is some what clear that, healing of wound in lowered pH conditions cu- glutamate is present in higher concentrations around the wound.

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