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DNA Analysis (Forensic Biology) | Forensic & Scientific Services | Queensland Health

The FSS DNA Analysis laboratory was experiences programming problems with their extraction robotics. The problems included drops forming on the tips, leading to cross-contamination. I was asked to take a look at the programming to determine whether any of the liquid handling settings could be improved. The test was physically set up and run and observed for problems. Following is a list of the steps which required some modifications to the liquid handling settings.

9. ADD LYSIS BUFFER
    - Increased dispense height
    - Increased tracking
    - Inserted a *post-dispense transport air gap* to remove bubbles
    - Decreased dispense height after mix step

17. REMOVE LYSIS
    - Decreased scan in speed
    - Decreased aspirate speed
    - Decreased *Retract From Liquid* speed
    - Decreased dispense height
    - Inserted a *post-dispense transport air gap* to remove bubbles

20. DISPENSE LYSIS BUFFER
    - Was splashing, bubbles after dispense
    - Decreased dispense speed

28. REMOVE LYSIS
    - Increased dispense height
    - Inserted a *post-dispense transport air gap* to remove bubbles
    - Decrease tracking on second "remove"

37. ADD WASH
    - Use dispense speed from 20

38. REMOVE WASH
    - Inserted a *post-dispense transport air gap* to remove bubbles

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62. ADD ELUTION BUFFER
Remove Flush

72. TRANSFER ELUANT
Decreased apirate and dispense speeds
Decreased *Retract From Liquid* speed

74. ADD ELUTION 2
Remove Flush

Where possible, dispense heights were used to allow the liquid to just touch the tip as dispensing ended. For example, if adding 600ul to a well, dispense at 550-600ul from the bottom. This enables any drops to be drawn off of the tip by the liquid in the well.

Using a *post-dispense transport air gap* ensures that any liquid remaining in the tip is drawn back up before the pipetting arm moves in an X or Y direction, thus negating any contamination of neighbouring wells.

Slowing down the *tip retraction speed* also helps to remove droplets from the test. After dispensing, if the tips come out of the liquid at the "usual" speeds (100mm/sec), you can often see drops being pulled out with the tip. This is just due to the surface tension in the well. By slowing down the tip retraction speed, the tip comes out of the liquid slowly, allowing any excess liquid on the outside of the tip to drain off the tip and remain in the well.

In many steps in this extraction test, the volume of liquid in the wells is quite high. As a result, it was useful to slow down the dispense speeds to avoid splashing.

While observing the test, the problems were noted and then the modifications done and the test carried out again. Actual extraction protocol liquids were used to completely mimic a "real" extraction run. The test was run several times with continuous modifications to improve the liquid handling settings. The final runs showed no dripping and a much neater and cleaner test.