Thyroid hormones T3 and T4 and their relationship with fibrinolysis variables.

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Background
It has been reported that thyroid function may influence haemostasis variables. We tested for possible relationships with fibrinolysis variables in a cohort of 490 young women planning to start the use of oral contraceptives.

Methods and subjects
The group tested had an age distribution from 17 - 35 (mean 23) y and a mean BMI of 22.4 (SD: 2.5). Both T3 and T4 were measured as markers of thyroid function. Fibrinolytic variables were t-PA antigen and activity, PAI-1 antigen, plasminogen, PAP and, D-dimer. Inflammation markers tested were CRP and fibrinogen.

Results
a) T3 and T4; age and BMI
T3 and T4 were found to show a fair correlation ($r^2 = 0.446$) and analysis was focussed on T3 divided in quintiles. Results with T3 were checked for concordance with T4. No correlation of T3 with age and BMI was evident.

b) Relationships with plasminogen, PAP and D-dimer
Plasminogen and PAP showed no significant relationship with T3. D-dimer showed a significant, modest elevation of around 10% in the 4th and 5th quintile of T3.

c) t-PA and PAI-1
T-PA and in particular PAI-1 showed a significant difference with the first quintile (= reference). The fifth Q of T3, showed mildly elevated PAI-1 (150%), reduced t-PA activity (85%) and no difference in t-PA antigen (see figure 1).

d) CRP and fibrinogen
Both CRP (190%) and fibrinogen (105%) showed a significant higher level in the fifth Q of T3 only.

e) Factor analysis.
To unravel mechanistic relationships, factor analysis was applied to variables sensitive to T3.

Discussion
It is observed that inflammatory markers are higher in the upper quintile of T3 (fig 2) and that this coincides with increased d-dimer. It suggests that increased d-dimer is mainly related to inflammation determinants. PAI-1 and t-PA activity form a different cluster that shows relations within individuals.

Conclusions
- There is no strong relationship between thyroid hormones and fibrinolysis function within the normal range.
- Mildly strong associations restricted to higher T3 levels with PAI-1/t-PA are not related to those in D-dimer.

![Figure 1: Medians of t-PA antigen and activity and PAI-1 antigen relative to the value in the first quintile of T3.](image1)

![Figure 2: Medians of C-reactive protein and fibrinogen relative to the value in the first quintile of T3.](image2)

![Figure 3: Factor analysis in the whole cohort.](image3)