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hormones. However, there were differences depending on vaginal versus planned cesarean section deliveries. In women carrying a male fetus we found significantly higher levels of 17-OH-pregnenedione, progesterone, cortisol, corticosterone and significantly lower levels of estradiol in those undergoing spontaneous vaginal delivery. However, we found no significant differences in the cord blood of newborn males from either delivery type. We established reference ranges for our analysis methods, which should be useful for further studies as well as in standard clinical practice.

Acknowledgments
The study was supported by the project MH CZ - DRO (Institute of Endocrinology - EU, 00023761), and by the grant MH CR 17-30528 A from the Czech Health Research Council.

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**P317**
Characterization of the expression and physiological roles of thyroid-stimulating hormone receptor in the male testis
Hsun Wang & Ching-Wei Luo
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Thyroid-stimulating hormone receptor (TSHR) is typically known to be expressed in the thyroid gland of mammals for the control of body metabolism. However, because the TSHR ancestor is the only glycoprotein hormone receptor found in invertebrates, we hypothesized that TSHR evolves much earlier than FSHR and LH-R and thus can be expressed in mammalian gonads for certain uncharacterized impacts. To prove this, real-time PCR quantification against Tshr in all male mouse reproductive organs was performed. The results indicated, that Tshr is mainly expressed in the testis where it is increased in an age-dependent manner. TSHR is located mainly in Sertoli cells and moderately in germ cells; such a profile was further confirmed using isolated primary mouse Sertoli cells. Gene regulatory test using the TM4 Sertoli cell line showed that Tshr expression can be increased via the cAMP cascade. In terms of the cognate ligands for TSHR, we demonstrated that the testicular TSHR is likely to be activated via an endocrine loop through the pituitary-secreted TSH since the negligible level of the genes encoding TSH or thyroidstimulin can be detected in male reproductive organs. Furthermore, using cultured testes tubules or explants, TSH treatment can not only promote the proliferation of germ cells *in vivo* but also increase the transcripts of Tgn, Tpo and Sertoli-Sertoli. Taken together, activation of the TSHR signalling in situ can influence spermatogenesis and may potentially regulate the amounts of thyroid hormones locally. Therefore, our findings overthrow the traditional concept regarding the physiological roles of TSHR and may open a new era of TSHR functions in the reproductive system.

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**P318**
Semen quality in uncontrolled acromegalic patients with hypogonadism
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Objective
Growth hormone (GH) activity might be implicated in male reproductive function. One previous study has suggested significantly reduced semen quality in untreated acromegalic patients due to both reduced sperm counts and motility. Design and methods
A retrospective study comprising 10 uncontrolled hypogonadal acromegalic patients (median age 29y) who delivered semen for cryopreservation before initiation of testosterone therapy. Sperm variables and hormone concentrations were compared to those of 10 non-acromegalic hypogonadal men with pituitary disease (age 31 years) and those of young healthy men (n = 340).

Results
80% of acromegalic patients vs 50% of non-acromegalic patients had total sperm counts above 39 million and progressive motile spermatozoa above 32% (P = 0.18) (WHO criteria for normal semen quality based on sperm counts and motility). The corresponding number in healthy controls was 82%. The prevalence of normal semen quality in acromegalic patients vs healthy controls was 80% vs 82% (P = 0.55) and in non-acromegalic patients vs healthy controls 50% vs 82% (P = 0.022). Serum IGF-1 was higher in acromegalic patients vs non-acromegalic patients 1017 (421–1434) vs 211 (91–271) ng/ml (P < 0.001). For reproductive hormone levels there were no differences between acromegalic patients vs non-acromegalic patients (P-values between 0.10 and 0.61). Patients (n = 20) vs healthy controls had lower serum testosterone 5.4 (2.2–7.6) vs 19.7 (15.5–24.5) nmol/l (P = 0.001), calculated free testosterone 145 (56–183) vs 464 (359–574) pmol/l (P < 0.001), LH (P = 0.002), and inhibin b (P < 0.001). Levels of FSH were similar (P = 0.63).

Conclusions
Despite severe Leydig cell insufficiency acromegalic patients had semen quality similar to healthy controls based on determination of the number of progressively motile spermatozoa. By contrast non-acromegalic patients had reduced semen quality. Our data do not support reduced semen quality in acromegaly.

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**P319**
Characteristics, geographical distribution and age at diagnosis of patients with Klinefelter syndrome in Italy: a cohort study from the Klinefelter Italian Group (KING)
Daniela Pasquali1, Andrea Garolla2, Giacomo Accardo3, Rosa di Fria4, Vittorio Simeoni5, Alberto Ferlin6, Mario Maggi7, Carlo Foresta8, Linda Vignozzi9, Giovanni Corona10, Fabio Lanfranco11, Vincenzo Rochira12, Aldo E Cälgero13, Vito A Giagulli14, Marco Bonomi15, Rosario Pivonello15, Giancarlo Baleria16, Alessandro Pizzocaro17, Pietro Salacca18, Antonio Aversa16 & Arcangelo Barbonetti19
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Introduction
Klinefelter syndrome (KS) is the most frequent chromosomal disorders, occurring in 1:500 to 1:1000 live male births, associated to male infertility. Although significant research has been conducted, KS remains frustratingly underdiagnosed with a remarkable portion of cases being unidentified. Under diagnosis may be due to man’s hesitancy about seeking medical counseling, low awareness of KS among health professionals, and failure by health professionals to perform routine genital examinations in adult men.

Aim
Our purpose was to describe the phenotypic characteristics and the hormonal patterns of a cohort of patients currently attending a national network of academic or general hospitals of the Klinefelter Italian Group (KING). Moreover, we focused our interest on the geographical distribution, and age at diagnosis of KS in Italy.

Methods
A multicenter, observational study of 594 KS was performed among the patients regularly attending the KING centers, after written informed consent has been obtained.

Results
The mean age was 37.4 ± 13.4 years (median IQR 28–46). The mean testicular volume was 3 ml in both tests, BMI was 26.6 ± 5.5 ± 8 and 25.5% of KS meet the diagnostic criteria for metabolic syndrome (Mets). Mean total testosterone was 330 ± 9.1 ng/dl, LH and FSH mean levels were 16.6 (median IQR 8.8–22.5) and 28.5 (median IQR 17.5–39), respectively. A descriptive analysis performed in 594 KS, showed that 329 KS were referred to KING centers of Northern Italy, 65 and 200 KS patients to KING facilities in Central and Southern Italy, respectively. Analysis of variance showed significant statistical differences (P < 0.00000) between the age at diagnosis of the KS of the three geographical groups. In particular, the age of KS patients was significantly lower in KS (33.3 ± 13.3 years) compared to Central and Northern Italy (40.2 ± 12.5 s.d. and 39.2 ± 13.3 s.d.).

Conclusions
Our preliminary data showed that KS is highly underdiagnosed in Italy, raising the question of the true prevalence of KS. Our patients presented with a wide spectrum of the classical Klinefelter symptoms. KS were overweight and, surprisingly, only 25.5% of them were diagnosed with Mets. This figure is very close to the Mets prevalence in the Italian general population which is around 26%.

In adulthood, two features were consistently present in every subject: small testes and high FSH and LH/testosterone ratio, despite normal testosterone levels. The

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P320
Gonadal Function in Human Immunodeficiency Virus (HIV)-Infected Men: comparison between Isotope Dilution-Liquid Chromatography-Tandem Mass Spectrometry (ID-LC-MS/MS) and Chemiluminescent Immunoassay (CI)
Sara De Vincentis1,2, Maria Chiara Decaroli1,2, Flaminia Fanelli3, Marco Mezzullo1, Chiara Diizzu1, Fabio Morina1, Davide Bertani1, Daniele Santi1, Enrica Baraldi1, Simonetta Tagliavini1, Laura Roli1, Tommaso Trenti1, Uberto Pagotto1, Giovanni Guaraldi1 & Vincenzo Rochira1
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Background
HIV-infection is associated to premature decline of serum T. However, prevalence and biochemical characterization of hypogonadism in HIV-infected men are still to be well defined.

Aim
To evaluate the gonadal status in HIV-infected men by assessing circulating total T (TT) with either ID-LC-MS/MS or CI.

Methods
Prospective, cross-sectional, observational study on HIV-infected men with ongoing Highly Active Antiretroviral Therapy (HAART). Serum TT, gonadotropins and sex hormone-binding globulin (SHBG) were measured by CI (Architect, Abbott, USA). TT was also assessed by a validated in house ID-LC-MS/MS. Free T (FT) was calculated by Vermeulen equation. Hypogonadism was defined as serum TT levels below 320 ng/dl and/or free T levels below 0.956. Statistical analysis: Parameters were not normally distributed and Mann-Whitney U test was used to compare continuous variables. Categorical variables were compared using Chi-Square test, while correlations were performed using linear regression models.

Results
315 consecutive HIV-infected men were enrolled (mean age 45.56 ± 5.61 years; average duration of HIV-infection 16.57 ± 10.45 years). Serum TT levels assessed by LC-MS/MS (mean 652.1 ± 229.1 ng/dl) were significantly lower compared to CI (mean 740.2 ± 274.7 ng/dl) (P < 0.0001). As a consequence, prevalence of T deficiency was significantly higher comparing LC-MS/MS to CI (5.4 vs 3.2%, P < 0.0001), 56 patients (17.8%) showed SHBG above the normal range (> 71.4 nmol/l). Considering calculated FT, the prevalence of hypogonadism was 9.8% using LC-MS/MS and 7.0% using CI, with a significant difference between methodologies (P < 0.0001). TT assessed by LC-MS/MS was directly related to TT assessed with CI (Beta = 0.956, R² = 0.913, P < 0.0001), as well as FT (Beta = 0.934, R² = 0.873, P < 0.0001). TT combined with luteinizing hormone (LH) levels was used to classify hypogonadism. By including compensated form of hypogonadism, the prevalence raised to 15.6% for TT and to 17% for FT.

Conclusions
To the best of our knowledge, this is the first properly-designed prospective study aiming to investigate the gonadal status of HIV-infected men with both LC-MS/MS and CI, together with gonadotropins. Notwithstanding the strong correlation found between the two methodologies, the prevalence of hypogonadism results underestimated when CI is used compared to ID-LC-MS/MS in HIV-infected patients. In clinical practice, SHBG for calculated FT is essential for the detection of T deficiency, revealing the real prevalence of hypogonadism in this clinical setting.

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P321
Automated free testosterone assay: validation and usual values
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Introduction
Testosterone circulates under different forms in blood, mainly bound to proteins i.e. Sex Hormone Binding Globulin (SHBG) and albumin. Free testosterone (FT), the biologically active form, represents 2% of total testosterone (TT). FT measurement is mainly indicated when TT level is discordant with clinical picture but remains technically challenging. Indeed, as for all free hormones, gold standard method relies on equilibrium dialysis, unusable in routine. Direct immunoassays by competition have thus been designed, traditionally based on sensible radioactive detection signal (RIA). FT can also be calculated from TT, SHBG and albumin levels. Our work aimed to compare a new automated immunoassay to preexisting dosages and to propose adapted usual values.

Materials and methods
Analytical performances of this new FT assay were evaluated. FT was therefore determined in 164 patients (68 women, 96 men) using the new immunoassay (IS-5300, IDS-iSYS Free Testosterone), a RIA immunoassay (KIP10000, DIAsource), and a calculation based on TT (RIA TESTO-CT2, Cisbio), SHBG, and albumin (Cobas ROCHE) concentrations. Usual values for the new dosage were established.

Results
Analytical performances of the new assay claimed by the manufacturer were confirmed and comparable with those of the RIA assay except for a higher detection limit. Correlation between immunoassays was satisfactory in men (R² = 0.77) and weaker in women (R² = 0.45), results with the new automated dosage being globally 30% lower. Correlation between both immunoassays and calculated FT was also satisfactory in men (respectively R² = 0.68 for automated and 0.76 for RIA immunoassays) and poor in women (respectively R² = 0.15 and 0.13). Calculated FT was much higher than measured FT, as the corresponding reference values proposed by the manufacturers. This discrepancy was confirmed by the analysis of external quality controls results whatever the direct immunoassay. We proposed preliminary usual values (minimal and maximum values observed in the subgroup of patients with normal testosterone and SHBG levels): 18.9–51.7 pmol/l in men < 50 years old (n = 23); 7.4–39.5 pmol/l in men > 50 years old (n = 33); < 6.2 pmol/l in women < 50 years old (n = 34) and < 4.3 pmol/l in women > 50 years old (n = 23).

Conclusion
IDS-iSYS FT assay is one of the first automated assays allowing FT dosage. Its analytical performances are suitable and provide valuable results in comparison to both RIA immunoassay and calculated FT, at least in men. Clinicians should pay attention to FT usual values indicated by the laboratories, given the large differences observed, particularly between direct immunoassays and calculated FT.

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P322
Assessment of biochemical hyperandrogenism in PCOs by liquid chromatography tandem mass spectrometry using a multistroid kit: focus on testosterone and androstenedione
Giorgia Grasso1, Valentina Morelli1, Elsa Polledri1, Silvia Fustinioni1,2, Iacopo Chiudini1,4, Ferruccio Cerrotti1, Simona D’Agostino3, Francesca Filippis, Edgardo Somigliana1, Giovanna Mantovani1,3 & Maura Arosio1,3
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Objective
The identification of hyperandrogenism represents the cornerstone for the assessment of polycystic ovary syndrome (PCOs). However, its definition has always been troubling, mostly because of the poor accuracy shown by routine
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