Case Study : using monitoring of body composition data obtained by bioimpedance in training of an high level runner.

Julien Rebeyrol[1], Marie-Valérie Moreno[1], Arnaud Vannicatte[2]

1.BioparHom, La Base, Technolac, 73370 Bourget-du-Lac, France – Email : julien.rebeyrol@bioparhom.com – Tel : +33 9 51 95 08 18
2.UTC section Sport Elite – 60203 Compiègne, France.

Aim : The aim of this case study is to observe the evolution of metabolic, hydric and tissular parameters face to training load of a high-level runner. Several body composition parameters are useful in physical preparation : body cell mass, wich is hardly correlated with performance, metabolic activity indicator, traducing cellular exchange capacity of athlete (metabolic fatigue), tissular distribution, using for estimate Weight/Power rate and hydration rates, often considered like a limitant factor of performance. The aim of this case study is to show that bioimpedance analysis is able to improve performance by optimizing training load, hydration and nutrition using body composition parameters.

Methods : The subject of this case study is a high-level trail runner, 29 years old, 1m75 and 67,9kg. Z-Métrix® (BioparHom® compagny, France) is a multi-frequency impedancemeter validated by a clinical study in Centre Hospitalier de Compiègne. It permits to collect resistances (R), reactances (X) of frequencies from1kHz to 1000 kHz. Using a new model derived from Cole-Cole model, resistances of extracellular compartment (Re) and total body compartment (Rinf) are obtained. With independent and specific equations, hydric, tissular and metabolic indicators are collected. Training Load (TL) is expressed with Banister method using monotony (Mo), strain (St) and fitness (Fit). They are expressed on average by period, that is the interval between two analysis. Z-Métrix® analysis are realized during 39 weeks, corresponding to 12 analysis.

Results : Between analysis 1 (beginning of preparation) and analysis 11 (during tapering), this runner loses 8,2kg (73,9kg to 65,7kg) and 4,7% of fat-mass (12% to 7,3%). His metabolic activity indicator, traducing metabolic fatigue, increases of 5,2 (38,5 to 43,7) . His body cell mass increases of 7% (47,1% to 54,1%) and his muscle mass increases of 4,3% (41,9% to 46,2%). His body hydration rates is weak and constant during all the period (58,8% ±1,9%) while his fat-free mass hydration is increasing until season aim (38,5% to 59%). Training Load increases constantly until season aim (101 UA to 231 UA), Monotony is constant (1,1 ±0,4UA) like Strain (345 ±139UA) and Fitness (1,3 ± 0,9UA).

Discussion : Metabolic indicators variations permit to follow training level using training loads indicators (monotony, strain, fitness). Tissular indicators are the expression of training load increasing and impact of competition on body composition. Following hydric indicators allow to control the dehydration factor during preparation, weakly percepted by this runner but hardly present. To sum up, this case study demonstrates that a body composition analysis, clinically validated, fast and non-invasive, may be realized using metabolic, tissular and hydric indicators in order to improve training, nutrition and hydration of the athlete. Moreover, this follow-up may be used in order to detect overtraining.

Key words : *Body composition – Bioimpedance – Training Load – Fat mass – Hydration*