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# Development of a new diagnosis approach by MRI of papillary thyroid cancer using a vectorized contrast agent directed against galectin-1

Type: Scientific Session communications

Topic: Preclinical Studies and Basic Science / Molecular and cellular imaging

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## Purpose/Introduction

The worldwide incidence of the thyroid cancer, the most common endocrine malignancy, is still increasing nowadays. The main challenge is to diagnose the patients who really need a surgery. Indeed, despite the frequency of thyroid nodules, 90% of surgeries are made for benign lesions. Current diagnosis approaches imply painful and useless thyroid surgeries. Thereby, we propose to develop a new and non-invasive diagnosis approach of papillary carcinoma.

Galectin-1 (gal-1) has been targeted as a diagnostic tool for well-differentiated thyroid cancers. It is a small adhesion protein expressed in muscles, neurons and embryonic tissues in non-pathologic conditions. Mostly secreted, this protein can also be found in the cytoplasm and the nucleus. It is involved in cellular adhesion, aggregation, migration and cell cycle regulation phenomena. Moreover, gal-1 is overexpressed in several cancers whose thyroid cancer is one of them. Actually, gal-1 is implied in tumour progression.

## Subjects and Methods

The phage display technique has been used to identify peptides targeting gal-1. Successive rounds have been performed by exposing the immobilized target to a phage library. Each phage clone wears on its capsid a different random peptide sequence. After the pre-selection on a control protein, the washing and the elution steps, the phages bound to gal-1 have been collected and amplified to start a new round. The affinity towards gal-1 of the outputs has been evaluated by ELISA and showed an increase along the rounds. From the sixth output, 50 clones have been isolated and their affinity evaluated. Two clones showed a good specific affinity towards gal-1. The peptide sequence has been revealed after DNA extraction and the 2 peptides (P1 and P8) were synthesized.

## Results

After evaluation of the affinity of P1 and P8, their cellular localization has been demonstrated by immunohistochemistry on human well-differentiated thyroid cancer slices. P1 shown a better specific affinity on histological sections. Moreover, they perfectly co-localized with gal-1 in TPC-1 cells (derived from papillary thyroid cancer) as demonstrated by immunofluorescence. Interest is focused on P1, which has been thereafter synthesized and conjugated to a contrast agent (USPIO) for MRI. The binding of this vectorized contrast agent has been validated on papillary thyroid cancer biopsies.

## Discussion/Conclusion

Peptide 1 coupled to an MRI contrast agent seems to be a promising targeting agent against gal-1 for the thyroid cancer diagnosis. Subsequent to the *in vitro* assays, vectorized contrast agents will be assessed on murine models of papillary thyroid cancer.

## References

Pacini et al., Annals of Oncology.2010;21:v214

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